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ABSTRACT

While many health plans have increased the proportion of costs borne by users, opponents to cost sharing fear that this may result in poorer health for children. The Rand Health Insurance Experiment examined this issue in a general population. Health outcomes of children in a free-care plan were compared with those of children in cost-sharing plans. From November 1974 through January 1982, 1,844 children between the ages of 0 and 13 were tracked. Families from six cities and counties nationwide were assigned to either a free-care health plan or to one of several cost-sharing plans for 3 to 5 years. The effects of cost sharing on measures of physiologic function, physical health, mental health, and general health perceptions were assessed. The results revealed that, for the typical child in the study, no discernible differences in health status were observed between those on the free-care plan and those on cost-sharing plans. No differences were observed among the cost-sharing plans. These findings suggest that insurance plans can be designed to shield the poor from excessive cost-sharing and preserve demand-reducing incentives for a non-aged general population without producing unacceptable health effects. (Seven appendices, 61 data tables, and nine pages of references are included.) (NB)

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The Effects of Cost Sharing on the Health of Children

Robert Otto Burciaga Valdez

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The Effects of Cost Sharing on the Health of Children

Robert Otto Burciaga Valdez

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PREFACE

This report presents findings from an analysis of the health status of children participating in the Rand Health Insurance Experiment (HIE), a controlled trial of cost sharing in health insurance. The project began in 1973 with a research grant from the Office of Economic Opportunity and was later supported by a grant from the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services (formerly the Department of Health, Education, and Welfare).

The original experimental design was described by Joseph P. Newhouse in "A Design for a Health Insurance Experiment," *Inquiry*, Vol. 11, March 1974. Modifications to this design were summarized in "Some Interim Results from a Controlled Trial of Cost Sharing in Health Insurance," *New England Journal of Medicine*, Vol. 305, December 17, 1981, by Joseph P. Newhouse, Willard G. Manning, Carl N. Morris, and others.

A summary version of the present report appeared in the May 1985 issue of *Pediatrics*. The report contains detailed information about the child health status analyses. Health status results for the adult population of the experiment were reported by R. H. Brook et al. in the December 8, 1983, issue of *New England Journal of Medicine*, Vol. 309, pp. 1426–1434, and in *The Effect of Coinsurance on the Health of Adults: Results from the Rand Health Insurance Experiment*, Rand Report R-3055-HHS. These publications should be of interest to those concerned with issues of health care financing, medical treatment, and health status assessment.

SUMMARY

Expenditures on health care constitute more than 10 percent of the gross national product of the United States. Both government- and employer-sponsored health plans have attempted to induce reductions in the use of nonessential medical services and to restrain the increasing cost of medical care. To do so, they have increased the proportion of costs borne by users of medical services.

Opponents of cost sharing fear that requiring families to pay out of pocket for children's medical services imposes a financial barrier to service use that may result in poorer health for children. Although these fears have been widely held, little information has existed to resolve the issue. Previous studies have been limited to special populations, i.e., those not representative of the general population of U.S. children. Those studies suggested that increased use of medical services was associated with few or no detectable improvements in children's health, except among the poor. The first study to examine a general population was the Rand Health Insurance Experiment (HIE).

SAMPLE, INSURANCE PLANS, AND HEALTH MEASURES

The HIE analyses compared health outcomes of children enrolled in a free-care plan with those of children whose families bore a share of their medical expenses. Families came from six cities and counties scattered across the country. We tracked 1844 children aged 0–13 from November 1974 through January 1982.

Families were randomly assigned to one of several insurance plans for three or five years. One plan provided free care; the remaining plans required participants to pay a share of expenses. All plans covered ambulatory (outpatient) and hospital care, preventive services, most dental services, and prescription drugs.

We assessed the effects of cost sharing on measures of physiologic function, physical health, mental health, and general health perceptions.

RESULTS

For the typical child in our study no discernible differences in health status were observed between those on a free-care plan and those on cost-sharing plans. No differences were observed among the cost-sharing plans. Confidence intervals for contrasts were sufficiently narrow to rule out the possibility that substantial differences in health status as a result of insurance coverage were missed.

For the at-risk child, both poor and nonpoor, we similarly did not observe statistically significant differences in health outcomes as a result of differences in insurance coverage. However, confidence intervals for contrasts between free plan and cost-sharing plans were broad in some cases because of smaller sample sizes. Therefore, we are less certain that health effects did not differ for at-risk children. Indeed, one of those apparently insignificant differences may have been large enough to have clinical importance: 8 percent of poor children on the free plan suffered from anemia, compared to 22 percent of poor children on the cost-sharing plans.

We evaluated several potential problems that could have biased our results. Although families were randomly assigned to plans ahead of enrollment in the study, it was possible that participants differed slightly from plan to plan. Our results suggest that no bias was introduced by any such differences in the experiment. Neither did children differ by initial health status or other enrollment characteristics from plan to plan. Attrition from the study was low once families agreed to participate; 97 percent on the free plan and 92 percent on the cost-sharing plans fulfilled the study requirements.

ACKNOWLEDGMENTS

Many persons made substantial contributions to this work. I am especially indebted to Joseph Newhouse, Robert Brook, Arleen Leibowitz, and Albert Williams for years of encouragement and support.

William Rogers and John Ware, Jr., deserve many thanks for instructing me in the finer points of statistical analysis and health status measurement. I have also benefited from discussions with Emmett Keeler, Barbara Starfield, Birt Harvey, Samuel Pappelbaum, and the Committee on Child Health Financing of the American Academy of Pediatrics.

I am deeply grateful to my classmates, Yilmaz Arguden, David Apgar, Janice Hinton, Kyong Mann Jeon, Brian Leverich, Gregory Rest, Syam Sarma, and Kenneth Thorpe, who were always there when I needed consultation and support.

The manuscript was skillfully prepared by Connie Moreno. James Chiesa provided invaluable assistance in reorganizing this material.

Responsibility for the content of the work, of course, rests solely with me.

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I. INTRODUCTION

Expenditures on health care have grown to more than 10 percent of the gross national product of the United States. Health plans sponsored by the government and by private employers have attempted to restrain the increasing cost of medical care. They have tried to induce reductions in the use of nonessential medical services through increases in the coinsurance and deductibles that their beneficiaries must pay out of pocket (Brazda, 1982; Ginsburg, 1981 and 1982; and Phelps, 1982). Such cost sharing is now widespread (Goldsmith, 1984; Hewitt Associates, 1985). Opponents of cost sharing fear that requiring families to pay out of pocket for children's medical services will impose a financial barrier to the use of services, which may result in poorer health for children.

Do increases in cost sharing actually cause decreases in the use of services? Several studies carried out in the 1970s suggested that they do. Such findings have been obtained, for instance, from cross-section household surveys of medical demand (Phelps and Newhouse, 1974; Newhouse et al., 1979). These data, however, were often ill suited for estimating the magnitude of this effect. Either the data did not contain sufficient information about households' health insurance coverage or they were aggregated to show the average medical expenditure and average insurance coverage for residents of a state. In quasi-experimental studies, in which a natural change in insurance coverage was observed, a 25 percent coinsurance provision on the use of physician services under a comprehensive prepaid plan led to a 24 percent decline in the demand for such services (Scitovsky and Snider, 1972; Phelps and Newhouse, 1972; Scitovsky and McCall, 1977). A definitive answer, however, could be obtained only by a randomized, controlled experiment. To that end, the Rand Health Insurance Experiment (HIE) was undertaken. The HIE randomly assigned families to various health insurance plans. One group received all of their care free of charge; others paid some fraction of their medical bills up to a stipulated maximum.

In reporting the results of the HIE, Newhouse et al. (1982) concluded that for a nonaged population, people whose medical expenses were fully covered by insurance spent about 50 percent more than those who shared costs. One might argue that the demand for children's medical care may be more responsive to price than the demand for adults' care for two reasons. First, many children's

illnesses are acute and self-limiting (i.e., may not require a physician's attention for cure). In contrast to adults, few children suffer from serious, chronic disease. Second, because much of the care provided to children is preventive in nature, parents may believe it more discretionary than care for illness.

Analysis of HIE results for 1136 children (Leibowitz et al., 1985) shows that health care expenditures on children do respond to differences in cost sharing but to a lesser degree than expenditures on the population as a whole. Leibowitz et al. found that total annual medical expenditures per child[1] were about one-third higher in families who had no out-of-pocket costs than in those who paid 95 percent of their medical bills ($345 vs. $260, in 1983 dollars).

The responsiveness of children's medical expenditures was almost entirely due to the effect of cost sharing on use of outpatient services, which accounted for 55 percent of all health expenses for children (compared with 42 percent for adults). (The reliance on outpatient services is consistent with data reported by Rossiter and Salomon (1981).) Use of outpatient services decreased as cost sharing rose for all measures of service use—probability of seeing a physician, annual expenditures, number of visits per year, and number of treatment episodes. The last three of these measures were one-half to two-thirds higher in families paying nothing than in those paying 95 percent.[2] For example, free care was found to raise the number of outpatient visits from about two per year to a little over three. (The probability of seeing a physician varied less, especially for school-age children.[3])

Hospital expenditures on children generally did not respond significantly to differing levels of cost sharing, and the probability of being hospitalized during a year showed no consistent pattern related to cost sharing for older children. Younger children (0–4 years) in families not charged for inpatient services were, however, more likely to be hospitalized.

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[1]Annual expenditures were adjusted to provide more stable estimates of expenditure differences among insurance plans by removing the within-plan differences attributable to age, sex, initial health status, income, race, and other differences in experimental participation.

[2]Children receiving free medical care had 68 percent more annual oupatient expenditures and 67 percent more episodes of treatment (which broke down to 4.4 per year vs. 2.6 per year) than those whose families shared costs.

[3]The probability of a school-age child making at least one office visit was 85 percent for those on the free plan, 82 percent for those on 95 percent cost-sharing plans; for preschool-age children, the analogous probabilities were 95 percent and 82 percent. The average rate for children in the HIE did not differ significantly. The Leibowitz et al. (1985) results are based on interim data for four of the six study sites. Data for the South Carolina sites were unavailable.

It thus appears that cost sharing results in less use of medical services for children. Does it also result in poorer health? As discussed in Sec. II of this report, little was known about this issue before the HIE. There had been no studies of the effect of cost sharing on the health of children in a general population. Studies in special populations had suggested that increased use of medical services was associated with few or no detectable improvements in health, except among the poor. The HIE confirms those results for children drawn randomly from a general population (Secs. III and IV). The policy implications of the HIE findings are discussed in Sec. V.

II. PRIOR STUDIES

Judging from the debate over health care policy, many people apparently believe that more medical care results in better health. Indeed, a positive relationship between health and medical care has been demonstrated for a few children's conditions (Starfield, 1985). For example, vaccinations do prevent the spread of contagious diseases. For most other medical conditions the relationship is far less clear, although access to medical care can be demonstrated in some cases to reduce both morbidity and mortality, particularly in deprived populations (Starfield, 1982; Egbuonu and Starfield, 1982).

Some have argued that increasing national investments in medical care have not reaped adequate returns in health status (Burger, 1974; Kish, 1974). Indeed, the general consensus among medical care experts seems to be that more medical care, beyond some necessary level, does not produce better health (Rice and Wilson, 1976; Haggerty, 1985). A few even argue that more care results in poorer health (Crile, 1975; Fuchs, 1974; Illich, 1976), perhaps because of iatrogenesis.

If the consensus view is correct, we should expect little or no effect on children's health status from eliminating or reducing cost-sharing provisions that moderate use of medical care, if current levels of use exceed necessary levels. In the HIE we observed an increased use of services when cost-sharing provisions were reduced. Unfortunately, before the HIE, no one had conclusively demonstrated a relationship (or lack of relationship) between marginal increases in use of medical care as a result of more generous health insurance coverage and better health. Early attempts to evaluate the impact of health services on health by Donabedian et al. (1965) and Suchman (1965) failed to examine the direct effects of medical care. Instead, these early studies looked at the relationship between infant mortality and socioeconomic status.

More recent studies attempted to examine the effects of increased health resources on health outcomes (Anderson, 1972 and 1973; Radtke, 1974), usually with data collected for other purposes. Children have been the subject of a number of these studies. Some have looked at mortality, others at morbidity. Some have focused on poor children. Most of these studies suffer from data inadequacies or were designed to answer different questions.

ATTEMPTS TO DEMONSTRATE EFFECTS ON MORTALITY

Wennberg and Gittelsohn (1973) examined the relationship between extent of medical care resources and age-adjusted mortality rates. They found no significant relationship between these two factors. This result may have been observed because mortality rates, especially aggregate rates, are relatively insensitive to changes in amount of resources.

Cochrane et al. (1978) studied the relationship between various health resources and mortality rates in 18 developed countries. Their study suggests that increases in resources did not reduce mortality rates. The gross nature of the sample and the use of aggregate resource indicators, however, inhibit the applicability of this finding to more narrowly defined situations.

Miller and Stokes (1978) using a nonrandom sample of large Northeast counties examined the relationships among infant and age/sex-adjusted mortality, health resources (types of personnel, beds, nurses), and structural measures (education, income, and occupation). Their weak findings are consistent with previous studies that indicate little or no relationship between health resources and mortality rates.

Yantek (1981) reported on the impact of the British National Health Service on infant mortality and on the overall mortality rate of England. Again, there was little evidence that increased medical resources result in improved health status. He argued that declining infant mortality can be attributed largely to improved housing and nutrition post-World War II.

In a more controlled environment, Gordis and Markowitz (1971) studied differences in mortality, height, and weight of a random sample of children assigned to two systems of primary care. One group was assigned to a comprehensive care program. The second group acquired services from their usual sources. (Since this group thus received care in a variety of environments, this was not a rigorously controlled experiment.) The investigators found no differences between the two groups.

Grossman and Jacobowitz (1981), comparing differences in neonatal mortality in 1966–1968 and 1970–1972, and Hadley (1982), examining differences in 1969–1973 between samples of counties, show that numerous changes contributed to the reduction in neonatal mortality. Legalized abortions, increased access to family planning activities, and Medicaid coverage of prenatal care contributed the greatest effect on decreasing neonatal mortality.

When death rates were high because of infectious and parasitic diseases the rationale for using mortality as an index of child health status made considerable sense. Children's death rates in the United States, however, are extremely low and deaths result primarily from accidents or violence. Thus, they convey relatively little information on health status. More recent work has examined the relationship between morbidity and health resources.

ATTEMPTS TO DEMONSTRATE EFFECTS OF INCREASED ACCESS ON MORBIDITY

Investigators looking at health effects of service use have defined morbidity in a variety of ways. The most common definition has been the count of disability days or medical symptoms. Later studies began to identify specific illnesses or conditions that are relatively common among child populations to track the health status of children (Kessner et al., 1974).

Studies of Children in General

Using school absenteeism as a measure of health status, Moore and Frank (1973) evaluated whether children who enjoyed free care from a comprehensive health center were better off than those who did not use these services. The center provided pediatric, nursing, mental health, dental health, nutrition, and social services. No relationship could be demonstrated between the level of use of services and changes in absenteeism. Minor differences suggested that high users of the clinic experience increased absenteeism.

In a more recent study, however, Dutton and Silber (1980) offer data suggesting that small positive health effects might be expected for children whose families do not share costs. In their study of child health outcomes in six different ambulatory care settings, children in delivery systems that required no out-of-pocket payments experienced lower-than-expected illness levels. Children whose families shared costs experienced higher-than-expected levels of illness.

Studies of Low-Income Groups

An experiment conducted in a poor rural Navajo community examined the effects of introducing a system for comprehensive primary care on health (McDermott et al., 1972). Despite the increased availability of medical care services, little difference in the incidence of

disease was observed. The one exception was for otitis media (fluid in the middle ear) which decreased slightly over a five-year experimental period. The authors of this report suggest that the positive effects of medical care on health status were outweighed by the negative impact of environmental factors.

Other studies have consistently suggested positive associations between use of services and health in low-income children. Gordis (1973), for instance, reports that low-income children eligible for comprehensive care programs experienced significantly fewer admissions for rheumatic fever than needy children who were not eligible for such services.

Alpert et al. (1976) describe results of an experiment conducted before the introduction of Medicaid. It compared health outcomes of low-income children receiving primary care from group pediatric practices with those receiving only hospital-based emergent care. By small margins, children receiving nonhospital-based primary care experienced fewer hospitalizations, operations, and illness visits. They made more health supervision visits and started preventive services earlier; their families were generally more satisfied with care.

Rogers and Blendon (1977) argue that public programs in the United States that have increased access to medical care have reduced mortality and morbidity for specific groups within our society. They note that gross improvements in the health of the population have been observed in comprehensive care programs designed to increase access to medical care. As evidence of positive effects the authors rely on declining mortality rates and reductions in the differential rate of visits to physicians between low- and high-income groups.

Diehr et al. (1979) reported the results of a one-year study of a young needy population in Seattle. Participants in the study received free medical care either from a well-established prepaid group practice or from an independent practice plan with services available through almost all nonfederal solo and group practices. It was found that increased access to care through the independent plan was associated with lower perceived health status, more symptoms, and more perceived activity limitations. Unfortunately, data for children and adult participants were analyzed in aggregate and no information specifically relating to children's health outcomes was reported by the authors.

Data from the National Health Examination survey indicate that by all measures of disability or health rating, poor children and children living in single-parent families are in poorer health than other children (Kovar, 1982).

Irwin and Conroy-Hughes (1982) looked at children receiving services through Medicaid's Early and Periodic Screening, Diagnosis and

Treatment program. These children had 30 percent fewer abnormalities requiring treatment upon rescreening than they did before the program and also 30 percent fewer than nonparticipating children had.

CONCLUSION

The studies cited above imply that additional medical services provide little or no additional health benefits for children, except for the poor. However, these studies can only be regarded as suggestive. Few directly measured the use of services. Several of them measured effects on mortality, which is not a common enough outcome for children to yield meaningful results. Several relied on aggregate measures of service availability or health status. Only three were even quasi-experimental; two of those were restricted to low-income children, and none of them directly measured service use.

The HIE is the first controlled trial in a general population to confirm that marginal increases in medical care provide little or no benefit to children, except perhaps the poor. The design of the HIE and the methods by which its results were analyzed are discussed in the next section.

III. EXPERIMENTAL DESIGN AND ANALYTIC METHODS

In this section, we discuss the following aspects of our methodology:

- How the study participants were selected.
- The provisions of the insurance plans to which the participants were assigned.
- The health measures employed, including the manner in which data on those measures were collected and the measures' reliability, validity, and precision.
- Methods of analysis, including how we checked and adjusted for potential bias.

SAMPLE

A total of 3107 families were asked to participate in the HIE. Of those, 15 percent refused either a screening or baseline interview and thus were not enrolled in the study. Another 20 percent refused an enrollment interview or the offer of enrollment in the experimental plan. Those refusing the offer were no longer eligible to participate (Rogers and Camp, forthcoming).

Of the participating families, 956 of those assigned to fee-for-service insurance plans had children aged 0 to 13 at the time of family enrollment. Those children—a total of 1844—are the sample for the analyses reported here. Children from families assigned to a health maintenance organization are the subject of a subsequent analysis, as are all study participants aged 14 to 61 (Brook et al., 1984). Children born during the experiment were excluded from the analyses reported here (but not from experimental benefits) because the likelihood of births varied between the plans. They are the subject of a forthcoming analysis.

Except for certain intentional exclusions, participating families represent the general population of the six sites sampled: Dayton, Ohio; Seattle, Washington; Fitchburg and Franklin County, Massachusetts; and Charleston and Georgetown County, South Carolina. The following were intentionally excluded (Newhouse, 1974; Newhouse et al., 1982):

- Families with an annual income above $25,000 in 1974 dollars ($54,000 in 1982 dollars). These made up 3 percent of those contacted.

- Families in which the head of household was eligible for Medicare or would become so before the end of the study.
- Families participating in the Supplemental Security Income program. (No children were excluded from our sample as a result of this criterion.)
- Families eligible for the military medical care system.
- Institutionalized individuals, e.g., those imprisoned or in mental institutions.

INSURANCE PLANS

We assigned families electing to enroll in the trial to one of 14 insurance plans. Seventy percent of the families were enrolled for three years, 30 percent for five years. To make this assignment we used an unbiased random allocation method that made the distribution of family characteristics as similar as possible on each plan (Morris, 1979).

All plans had an identical, comprehensive set of covered services, including acute and preventive ambulatory care, all hospital care, mental health services, visual and auditory services, prescription drugs, supplies, and all dental services except orthodontia with fixed appliances. All plans also covered the services of nonphysician providers such as audiologists, chiropractors, clinical psychologists, optometrists, physical therapists, and speech therapists.

For the analyses reported here, participants entitled to receive all services free of charge were compared with those in the other 13 plans. The other plans included:

- The "individual deductible" plan, under which families paid 95 percent of outpatient costs up to an annual out-of-pocket expenditure of $150 for each person or $450 for a family. Inpatient care under this plan was free.
- The "intermediate" cost-sharing plans, under which families paid 25 or 50 percent of all medical expenses up to a specified fraction of annual income[1] or $1000 ($750 in some sites in some years), whichever was lower.
- The "catastrophic expense" plans, under which families paid 95 percent of all medical expenses up to a specified fraction[2] of

[1]This fraction was 5, 10 or 15 percent, depending on income (lower for lower income).
[2]As above.

annual income or $1000 ($750 in some sites in some years), whichever was lower.

The maximum expenditure limit of $1000 for the cost-sharing plans was not adjusted to account for the considerable price inflation experienced during the 1970s. The amounts represented by the specified fractions of family income grew with increasing income levels.

The cost-sharing plans are grouped and compared with the free plan because in analyses reported elsewhere no significant differences occurred within the cost-sharing plans (Appendix A). Grouping the cost-sharing plans eases exposition of our work without changing our findings or conclusions.

Families assigned to an insurance plan that offered less coverage than their pre-experiment insurance plan were reimbursed an amount equal to their maximum possible loss. For example, consider a family that was assigned to a plan with a $450 maximum out-of-pocket expenditure and that had a pre-experiment plan with a $100 deductible and a 20 percent coinsurance above the deductible. Such a family would have been paid $280 per year, i.e., 80 percent of the difference between $450 and $100. Thus, no family was financially worse off for participating in the experiment. These side payments had insignificant effects on demand for services (Newhouse et al., 1982).

MEASUREMENT OF HEALTH STATUS

How best to measure children's health remains an unresolved issue. Sullivan (1966), Berg (1973), and Ware (1976) have discussed the measurement of health status in general, and Starfield (1974) and Schach and Starfield (1973) have focused on problems of measuring children's health.

Studies of children's health have used measures of disability, measures related to abnormal conditions, or measures derived from parental assessment of children's health (Wallace, 1962; Mechanic, 1964; Talbot et al., 1971; Kaplan et al., 1972; Hu, 1973; Schach and Starfield, 1973; Kessner, 1974; Haggerty et al., 1975; Inman, 1976). More recent studies have also used assessments of health made by children themselves (Lewis and Lewis, 1982 and 1983).

In our analyses we used five physiologic measures based on data from physical examinations administered under the HIE, along with a measure of parental worry about physiologic function. The five physiologic variables were anemia, hay fever, fluid in the middle ear,

hearing loss, and visual acuity. These five were selected from a set of 12 tested conditions[3] because they can be readily detected, are fairly prevalent, are amenable to medical treatment, and have important adverse effects if left unattended.

We also used measures of perceived physical role limitations, mental health, and general health.[4] These health perception measures were chosen from among the various measures available because they provide the most comprehensive and global assessment of health status. Unlike other health perception measures, batteries assessing role limitations resulting from poor health, mental health status, and general health perceptions both past and present were fielded in all three age-appropriate health questionnaires.[5] Thus, these measures permitted us to follow children over the three- to five-year duration of the experiment.

Of the two types of health status measures examined (physiologic and health perceptions), the physiologic measures come closer to what many in the medical profession view as "illness." Further information about the health measures is given in Tables 1 and 2, and a detailed discussion is provided in Appendix B. Data on disability days were not available at the time of our analyses and will be the subject of a future publication.

Data Collection Methods

Information on perceived health measures was collected at the beginning of the study (enrollment) and upon leaving the study three or five years later (exit) using a medical history questionnaire (MHQ). We designed age-appropriate questionnaires to gather information for infants and toddlers (0–4 years), children in middle childhood (5–13

[3]The others were cancer, convulsions, dental conditions, bedwetting, growth and development disorders, lead poisoning, and urinary tract infections. Dental conditions, bedwetting, and growth and development are subjects of separate reports.

[4]In addition to clinical assessments and parental reports regarding disease-specific conditions, our measures assessed parental perceptions of: physical and role limitations resulting from poor health; mental health including symptoms of anxiety, depression, psychological well-being; general health perceptions (at the present, in the past, in relation to other children, resistence to illness, health worry/concern); pain and distress experienced by the child as a result of poor health; social relations (with other children, family, friends); and developmental milestones (parental satisfaction with eating, sleeping, bowel habits). We present data on the three major overall indicators of these health dimensions. The items used to assess these dimensions were selected from among the best available measures. Gaps identified in assessing child health status were filled with new measures adapted from HIE adult health status measures. The entire battery of measures has been thoroughly tested (Eisen et al., 1980).

[5]Health questionnaires were designed with age-appropriate responses for infants (0–4 years), children (5–13 years), and adults (14+ years).

Table 1

DEFINITIONS OF HEALTH STATUS VARIABLES AND PERCENTAGE AT RISK OF ILLNESS: PHYSIOLOGIC MEASURES AND PARENTAL WORRY

Health Variable and Definitions	Specific Scoring	% with Condition at Enrollment
ANEMIA STATUS: A dichotomous (0,1) indicator of low hemoglobin, adjusted for age and sex.	Defined as having anemia if hemoglobin falls below the following limits (in g/100 ml of blood): Boys and girls 6 mo to 2 years 10.0 2 years to 12 years 11.0 Boys only 13 years to 18 years 12.0 Girls only 13 years to 18 years 11.5	9.4
HAY FEVER STATUS: A dichotomous (0,1) indicator of whether the child is bothered by hay fever or other plant allergies.	Based on responses to MHQ for children 5 years or older.	8.4
FUNCTIONAL FAR VISION: Visual acuity with usual correction in better eye (i.e., glasses or contacts). Measured in Snellen lines.	Visual impairment indicated if score greater than 2; 2 = 20/20, 3 = 20/25, 4 = 20/30.	29.2
HEARING LOSS: A dichotomous (0,1) indicator of hearing impairment in the better ear.	Hearing impaired if average hearing threshold level in better ear (tested at 500, 1000, 2000 and 4000 HZ) is greater than 15 dB.	6.6
FLUID IN MIDDLE EAR: A dichotomous (0,1) indicator of fluid in either or both middle ears.	Tympanometry results indicate effusion or probable effusion according to the following criteria: Air Pressure (mm H_2O) / Compliance (Madsen Units) / Slope −400 to −100 / 5 to 10 / All −100 to 50 / 5.5 to 10 / All −100 to 50 / 5.5 to 4.5 / Flat or rounded −400 to −100 / 0 to 5 / Flat or rounded 50 to 300 / 5.5 to 10 / Flat or rounded	26.4
PARENTAL WORRY: A four-point scale measuring worry associated with anemia, hay fever, vision, or hearing loss.	The highest level of worry expressed about one of the physiologic conditions examined: 1 = Not at all, 4 = A great deal.	20.9*

*Percentage whose parents expressed any worry.

Table 2

DEFINITIONS OF HEALTH STATUS MEASURES: HEALTH PERCEPTIONS MEASURES

Health Variable and Definition	Typical Item	Meaning of a High Score
ROLE LIMITATIONS[a]: A dichotomous (0,1) measure that indicates whether child can play, go to school, or take part in usual activities free of limitations resulting from poor health.	Is this child limited in the amount or kind of other activities (such as playing, helping around the house, hobbies) because of health?	Child is limited in role activities as a result of poor health
MENTAL HEALTH RATING[b]: A standardized (0-10) scale that measures anxiety, depression, and psychological well-being during the past month. A high score represents better mental health.	During the *past month*, did this child seem to be anxious or worried?	Child is relaxed and cheerful.
GENERAL HEALTH RATING[c]: A standardized (0-10) scale that assesses perceptions of the child's health in the past, present, and future and susceptibility to illness. A high score represents better health.	In general, would you say this child's health is excellent, good, fair, or poor?	Child is in excellent health[d]

[a]Constructed from two items for children under five years of age and three items for children five years and older.

[b]This battery was not administered to children under five years of age; it was constructed from 12 items for children under 14 years and 38 items for those 14 years or older.

[c]Constructed from seven items for children under 14 years of age and 22 items for children 14 years and older.

[d]A 0.51 point difference equals the effect of having hay fever, controlling for all other differences.

years), and adolescents and adults (14 years and older) (Eisen et al., 1980; Ware et al., 1979 and forthcoming; Davies and Ware, 1981). (Questionnaires are reproduced in Appendix C.) The HIE relied on parental assessments (usually the mother's) for all children under 14 years of age and on self-reports for adolescents who were 14 to 18 years old at exit. (Recall that our sample is a cohort of those aged 0–13 at enrollment; thus the maximum age at exit was 18.)

In addition to these questionnaires, a medical screening examination assessed physiologic function for a random sample at enrollment (60

percent) and all exiting participants. Entrance screening was assigned to a random sample of participants on each plan to test for any effect of the examination in stimulating use. Exit screenings were conducted during the fall and winter months except in Massachusetts where they were conducted during the summer. The multiphasic screening was carried out by trained paramedical personnel using a mobil examination center at various locations in each site (Smith et al., 1978). Table 3 shows the types of screening tests administered for each of the conditions, along with the ages and numbers of individuals examined.

Reliability and Validity

The reliability, validity, and precision of the health status measures have been reported elsewhere (Eisen et al., 1980; Ware et al., 1979 and forthcoming; Davis and Ware, 1981; Smith et al., 1978; Rubenstein et al., 1985; Lohr et al., 1983; Foxman et al., 1983; Beck et al., 1983). We briefly summarize the findings here.

Physiological function. During the HIE screening, test-retest measurements were taken for audiometry, visual acuity, and tympanometry for children. Each child had at least one test repeated approximately one hour after its first administration. Duplicate blood samples were drawn on 5 to 10 percent of participants.

Table 3

MEDICAL SCREENING TESTS AND ELIGIBLE POPULATION

Disease Condition	Screening Test	Population Screened	Exit Only	Enrollment and Exit
Anemia	Hematocrit Hemoglobin	Children ages 6 months-18 years	639	906
Hearing loss	Pure-tone threshold Audiometry	Children ages 4-18 years	775	695
Fluid in middle ear	Tympanometry	Children ages 4-13 years, except those with surgery in past 6 months	627	360
Visual disorder	Near vision, with and without correction Far vision, with and without correction Pinhole acuity correction	Children ages 5-18 years	795	796

The following results were observed for test-retest evaluations:

- Hemoglobin measurements: The difference between the first and second measurement of hemoglobin ranged from −2.4 to 1.1 g/100 ml; the mean difference was 0.04 g and the standard deviation of the mean difference, 0.42 g.
- Vision: For natural far vision, the difference between the first and second measurements was never greater than 2 lines, and the mean absolute difference was 0.20 lines. For natural near vision, the difference was never greater than 1 line, and the mean absolute difference was 0.02 lines.
- Tympanometry: Of the 43 ears retested, 41 (95 percent) were classified the same at both tests. Of course, some agreement would have been expected by chance alone. To account for this, the data were evaluated according to the kappa statistic and found highly significant (kappa = 0.85, $p < 0.001$).
- Hearing: The mean difference between the first and second average hearing threshold levels for the better ear was 0.91 dB with a standard deviation of 2.84 dB.

Thus, we concluded that the HIE physiologic measures were of acceptable reliability for our analyses. The screening tests performed had been selected on the basis of logistics of performance, acceptability to participants, and acceptability to the medical community, including participants' physicians. Data on the sensitivity, specificity, and predictive power of screening tests are discussed at length elsewhere (Rubenstein et al., 1985; Lohr et al., 1983; Foxman et al., 1983; Beck et al., 1983).

Health perceptions. In general, health scores produced by the health perception measures provide adequate reliability for group comparisons and satisfied standard empirical criteria for reliability, precision, and empirical validity. We estimated internal-consistency reliability and homogeneity coefficients, i.e., average interitem correlations for the general and mental health ratings. Scores were sufficiently reliable for group comparisons (Chrombach $\alpha > 0.50$), and the homogeneity coefficients exceeded 0.30. The reliability coefficients were considerably higher than would have been achieved with single-item measures.

The reliability of the HIE general health status ratings measures is generally high; the mental health ratings range from 0.87 in the combined sites HIE school-age sample (N = 1468) to 0.96 in the adult sample (N = 5089), when estimated using internal-consistency methods

(Table 4). The general health ratings range from 0.76 to 0.89. Because attempts to create a multi-item scale for the three role activity limitations questions failed, children were assigned scores indicating whether the child reported having one or more of these limitations. We decided not to score children according to aggregate limitations scales because the sample was small and limitations rare.

Thus, the role limitations measure suffers from a lack of variability. Role limitations resulting from poor health are relatively rare (about 3 percent) in general populations of children (NCHS, 1981). Improvements in health, are difficult to detect with such a measure. Power calculations published in Eisen et al. (1980) indicate that the differences would have to be moderate to large to be detected using this measure. We were unwilling to exclude the possibility of a moderate or large effect of cost sharing a priori so this measure was included in our analyses. Other HIE measures are sufficiently variable to detect smaller effects.

Substantial stability of scores across repeated measurements a year apart were also observed to be generally quite high. Stability estimates

Table 4

RELIABILITY AND STABILITY ESTIMATES FOR HIE GENERAL HEALTH STATUS MEASURES

Measure	Form[a]	K[b]	Reliability[c]	One-Year Stability[d]
Role limitations	I,P	3	(e)	0.35
	A	2	0.92[f]	0.50
Mental health ratings	P	12	0.87	0.52
	A	38	0.96	0.64
General health ratings	I	7	0.77	0.49
	P	7	0.76	0.64
	A	22	0.89	0.68

[a]MHQ form: I = infants ages 0-4 years; P = children 5-13 years; A = adults 14+ years.

[b]Number of items.

[c]Internal-consistency reliability estimated by Cronbach's (1951) alpha, unless otherwise noted.

[d]Product-movement correlation between scores obtained approximately one year apart.

[e]Attempts to create summated rating scales failed for children so dichotomous scores were assigned to children with one or more role activities limitations.

[f]Coefficient of reproducibility.

range from a low of 0.35 for role limitations to a high of 0.68 for general health ratings.

The HIE produced a number of findings that assist one to determine the validity of the perceived health measures. Our cross-sectional studies included analyses of 136 correlations among different measures of health status including site-by-site analyses. It has been shown that the HIE health perception measures differentiate between well children and those with chronic serious conditions or acute illnesses. For example, the association between the general health rating index and the presence of chronic conditions was statistically significant for those in the 5–13 age group (GAMMA = -0.32, $p < 0.05$, two-tailed test). This association was significant but lower for acute illnesses. All HIE health perception measures discriminated between well children and children with some type of illness (Table 58, Eisen et al, 1980; the latter also contains details of other validity tests). It thus appears that the health perception measures are valid indicators of changes in health status during the course of the study.

The health perception measures are also valid in content. Content was based on Eisen et al. (1980), the most extensive review of content validity yet published for child health measures. The only significant shortcoming in the content of the HIE measures was the absence of any reference to child behavior problems. This was corrected during the course of the study by adding to the MHQs a comprehensive battery of multi-item scales measuring behavior problems based on the work of Achenbach (1978, 1979).

METHOD OF ANALYSIS

We used regression methods to estimate the influence of "explanatory" variables on a variety of "dependent" or "response" variables that measured health status at exit. The explanatory variables included three policy-relevant variables: type of insurance plan, family income (adjusted for family size and site), and health status at enrollment. We accounted for the influence of other experimental manipulations (e.g., taking the screening examination, time in the study, questionnaire form, and respondent) and demographic characteristics (e.g., education of the mother, race, sex, site) by including some or all of these variables in each of the regression equations (Appendix D).

Checking for Bias

We examined several problems that could have biased our results. First, families that agreed to participate in the study may have been different in some way from those that did not. In appraising sample loss, we distinguished the loss of potential participants before they were notified of plan assignment from sample loss after plan assignments were revealed. Sixty-nine percent of those not enrolling declined before being notified of their plan assignment. The loss of those individuals could not have biased our plan-related results. (They can affect the population to which the results can be generalized.)

Only 9 percent of the original sample refused to participated after learning their plan assignments. Refusal rates were lower for those assigned to the free plan than for those on the cost-sharing plans. The resulting samples, however, reflect the distributions of health and income, except for the lack of the top 3 percent of the income distribution, in the sites from which samples were drawn (Appendix E). Also, we compared enrollment values for participants in different insurance plans. There were no significant differences (see Table 5).

Attrition following enrollment was low (Table 6). Ninety-seven percent of those assigned to the free plan and 92 percent of those on cost-sharing plans completed the study normally. On the basis of enrollment characteristics, children who withdrew from the study appear similar to those who completed the study (Rogers and Camp, forthcoming). Thus, attrition from the study is unlikely to affect our results.

Second, families may have dropped out of the various plans at different rates as a function of members' health status. This is unlikely, since it has been found that the characteristics of the families who refused to participate in the HIE were not significantly different from those of the families who participated (Rogers and Camp, forthcoming).

Finally, some data were missing: A few exit questionnaires were incomplete or for some participants screening examinations were not required upon enrollment. The experimental design assured that the 60 percent of participants screened at enrollment were distributed randomly across insurance plans. In addition, we included in our regression equations the initial values of the health status variables as well as other variables known to influence health. Thus, we statistically controlled for any effect of nonrandom sample composition with respect to these explanatory variables. To avoid problems arising from incomplete exit questionnaires, we did not attempt to recover physiologic information on children who left the sample prematurely; all results

Table 5

RAW VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES OF CHILDREN AGED 0-13 AT ENROLLMENT, BY TYPE OF EXPERIMENTAL INSURANCE PLAN

Variable and Description[a]	Free Plan	Cost-Sharing Plans	t-Test Value[b]
No. of enrollees	599	1245	
Mean age (yr)	7.1	7.2	0.54
Sex (% male)	52	52	−0.23
Race (% nonwhite)	21	25	1.37
Mean family income adjusted for family size and site ($ 1982)	17,200	18,700	1.65
Mean education of mother (yr)	11.8	11.9	0.84
% of children hospitalized in year before enrollment	7.5	7.1	−0.30
Mean number of physician visits in year before enrollment	3.3	3.1	0.86
% taking physical screening examination	64	60	−1.56
% enrolled for three years	69	70	0.38
Role limitations: % limited			
Enrollment sample	3.1	3.4	0.30
Analytic sample	2.8	3.1	0.33
Mental health rating: mean on 0-10 scale; higher score represents better health			
Enrollment sample	6.2	6.1	0.97
Analytic sample	6.2	6.2	0.06
General health rating: mean on 0-10 scale; higher score represents better health			
Enrollment sample	5.9	5.9	0.20
Analytic sample	5.9	6.0	−0.20
Anemia: % with low hemoglobin levels			
Enrollment sample	8.6	9.8	0.66
Analytic sample	7.9	10.0	1.17
Hay fever: % bothered by plant allergies			
Enrollment sample	9.8	7.7	−1.02
Analytic sample	12.4	9.9	−0.88
Functional far vision: mean in Snellen lines; higher score represents poorer vision			
Enrollment sample	2.8	2.8	−0.49
Analytic sample	2.8	2.7	−0.75
Hearing Loss: % with hearing impairments			
Enrollment sample	8.6	5.6	−1.46
Analytic sample	8.7	4.7	−1.95
Fluid in middle ear: % with suspected effusion			
Enrollment sample	27.9	25.6	−0.66
Analytic sample	32.5	27.4	−0.99

[a]For demographic data, entries include everyone with valid enrollment data. For health measures, the mean score for the enrollment sample excludes children not assigned to an initial screening examination or missing data; mean scores for analytic samples exclude the same children in the enrollment sample plus those who did not have exit data, generally because of attrition.

[b]Test of difference between cost-sharing and free plan.

Table 6

NUMBER OF CHILDREN ACCORDING TO CATEGORY OF PARTICIPATION IN EXPERIMENT AND PLAN

Category of Participation	Free Plan		Cost-Sharing Plans	
	No.	%	No.	%
Total enrolled	599	100.0	1245	100.0
Completed study normally	579	96.7	1141	91.7
Voluntarily left study early	1	0.2	73	5.9
Terminated from study[a]	19	3.2	26	2.1
Died[b]	0	0.0	5	0.4

[a]Participation ended because family no longer fulfilled criteria for eligibility.

[b]Three deaths resulted from accidents (fire and asphyxia), one from murder, and one was from epileptiform seizure with anoxia.

are based only on values for those who completed the experiment normally.

Interpretation of Effects

To interpret the effect of the insurance plans, we used our regression equations to predict exit health status for children with defined sets of enrollment characteristics. Specifically, we calculated health status for two types of children: the typical child participant with average values on all characteristics and those "at risk" of disease owing to an existing condition. We chose to use this procedure for presenting health status results because it simplifies our exposition and permits the reader to focus attention on the experimental intervention over a large number of health status measures. (Regression equations and inference statistics for each health status measure are presented in Appendix D.)

The definition of "at risk" varied from condition to condition. For each health status measure, we defined children who scored in the bottom quarter of a health perceptions measure or who were identified as having the physiologic condition at enrollment as being "at risk" of illness for that condition. For example, a child was considered "at risk" of anemia if he or she had been classified as anemic at the enrollment medical screening examination. In the case of functional far vision "at

risk" means children with poorer than 20/20 vision when tested at enrollment. Children not assigned to the enrollment screening examination were missing initial health status data. Because we wanted to include these children in our analyis, we estimated initial health status scores for them from the values for other explanatory variables available at enrollment. Because families were randomly allocated to plans, this procedure should lead to unbiased estimates of the initial scores. These children were then included in our analyses but were given less weight when we determined the estimated plan effects (Dagenais, 1971).

We also estimated exit health for children from families with incomes in the lowest quarter of the enrollment income distribution. Such families had a mean income of $6200 in 1982 dollars. Families with incomes in the upper half of the distribution were considered "nonpoor" (a mean income of $30,000). Finally, because the effects of differential use of medical care should be most apparent in children who are ill *and* poor, we calculated our estimates for children who were poor *and* at risk. For all other explanatory variables in the regression equations, we used mean population values to generate the predicted exit scores.

To arrive at our predicted scores and plan constrasts we first estimated our regression models on the total available sample. We then created profiles of the typical child and children at risk of illness by assigning mean values for explanatory variables. An exit score was then generated based on the profiles and the estimated regression equation. Finally, scores on the free plan were contrasted with those on the cost-sharing plan.

Because we had no expectation that cost sharing would affect health status either negatively or positively in a general population, we used two-tailed t-tests of significance to evaluate differences between plans. Because children in a family share their mother's tendency to consult a physician, observations from members of the same family contain less unique information than would completely independent observations. Therefore, all statistical tests of significance were corrected for correlation of the error term within each family. They were also corrected for the nonconstant variance of the error term (Huber, 1967).

We followed the convention of labeling as "significant" any result likely to occur by chance no more than 5 percent of the time. Results falling short of this criterion should not be ignored, however. Differences too small for statistical significance could still be clinically or socially relevant.

IV. HOW COST SHARING AFFECTS HEALTH STATUS

We now discuss the effects of cost sharing on the health of average children, children with pre-existing conditions, and poor children. As explained in Sec. III, our results do not appear to be biased by sample loss or missing data.

EFFECTS OF PLAN ON HEALTH STATUS OF THE AVERAGE CHILD

For the typical child participant, we could not discern significant differences in health status between those who received free care and those on the cost-sharing plans (Table 7). Only the difference in the probability of having hay fever approached statistically significant levels ($p = 0.08$), and this measure suggested a greater prevalence of hay fever on the free plan (17 percent vs. 12 percent). No difference was observed among the cost-sharing plans. Taking all the measures together, the direction of estimated effects favored neither the free plan nor the cost-sharing plans.

For all measures confidence intervals for the difference between free and cost-sharing plans were fairly narrow. Thus, it is unlikely that substantial differences would have been detected in a larger sample.

EFFECTS OF PLAN ON HEALTH STATUS OF AT-RISK CHILDREN

For both poor and nonpoor children at risk of illness because of an existing condition, we observed no statistically significant difference between the free and cost-sharing plans for any of our measures (Table 8). Nevertheless, among poor families, those at-risk children on the free plan appeared to be less likely to have anemia at the conclusion of the experiment than those on the cost-sharing plans (8 vs. 22 percent). Although this difference was not statistically significant ($p = 0.12$), we believe it may well have clinical importance that should not be ignored.

Confidence intervals among the at-risk children are broader than those among all children because of the smaller sample size, so they are more likely to mask some clinically important differences. Therefore, we are less certain of our conclusion that health effects did not differ between plans in this case than we are for the case of the average child.

Table 7

PREDICTED EXIT VALUES OF HEALTH STATUS MEASURES FOR A CHILD WITH AVERAGE CHARACTERISTICS, BY MEASURE AND PLAN

Health Status Measure	No.[a]	Free Plan	Cost-Sharing Plans	Free Minus Cost Sharing[b]
		Health Perceptions		
Role limitations (%)	1480	2.6	2.6	0.0(−7,7)
Mental health rating[c]	1048	5.81	5.94	−0.13(−0 .37,0.11)
General health rating[c]	1506	5.47	5.48	−0.01(−0.20,0.18)
		Physiologic Measures		
Anemia (%)	1538	1.9	2.1	−0.20(−1.8,1.4)
Hay fever (%)	1378	17	12	5.0(0,10)[d]
Hearing loss (%)	1463	7.2	6.2	1.0(−1.7,3.7)
Fluid in middle ear (%)	987	25	25	0.0(−7,7)
Functional far vision[e]	1591	2.60	2.67	−0.07(−0.21,0.07)
Parental worry[f]	1535	1.40	1.35	0.05(−0.02,0.12)

[a]Sample sizes are dissimilar because the number of children included in each health status analysis differs because of age restrictions or missing data.

[b]95 percent confidence intervals in parentheses; approximate confidence intervals for dichotomous indicator variables.

[c]0-10 scale; a higher value denotes better health.

[d]t = 1.74, p = 0 .08.

[e]In Snellen line values 2 = 20/20, 3 = 20/25, 4 = 20/30.

[f]4 point scale—1 = not at all; 2 = a little; 3 = somewhat; 4 = a great deal.

EFFECTS OF PLAN ON LOW-INCOME FAMILIES

Here we present the effects of cost sharing on the health of poor children in general. (More details are given in Appendix F.) We also look at a possible rationale for our findings.

Health Status of Poor Children

Our work in the previous section, focusing on children who were classified as poor and at risk, was subject to small samples and wide confidence limits around the estimates of health effects. To narrow the confidence intervals, we combined both the high- and low-risk

Table 8

PREDICTED EXIT VALUES OF HEALTH STATUS MEASURES FOR CHILDREN WITH PRE-EXISTING CONDITIONS, BY MEASURE, PLAN, AND INCOME

	Poor			Nonpoor		
Health Status Measure	Free Plan	Cost-Sharing Plans	Free Minus Cost Sharing[a]	Free Plan	Cost-Sharing Plans	Free Minus Cost Sharing[a]
Health Perceptions						
Role limitations (%)	22	30	−8(−35,19)	24	21	3(−19,25)
Mental health rating[b]	4.96	5.16	−0.20(−0.61,0.21)	5.29	5.39	−0.10(−0.43, 0.23)
General health rating[b]	4.77	4.60	0.17(−0.22,0.56)	4.76	4.87	−0.11(−0.42,0.20)
Physiologic Measures						
Anemia (%)	8	22	−14.00(−31,3)[c]	12	8	4(−7,15)
Hay fever (%)	61	44	17.00(−10,44)	71	66	5(−16,26)
Hearing loss (%)	35	43	−8.00(−35,19)	36	27	9(−15,33)
Fluid in middle ear (%)	56	57	−1.00(−18,16)	55	55	0(−15,15)
Functional far vision[d]	3.18	3.23	−0.05(−0.32,0.22)	3.10	3.17	−0.07(−0.29,0.15)

[a]95 percent confidence intervals in parentheses; approximate confidence intervals for dichotomous indicator variables.
[b]0-10 scale; higher value indicates better health.
[c]$t = 1.55$, $p = 0.12$.
[d]In Snellen line values 2 = 20/20, 3 = 20/25, 4 = 20/30.

children with low incomes, and contrasted them with higher-income children. Table 9 presents mean values of relevant variables at enrollment for poor and nonpoor (lowest quarter of the family income distribution vs. upper half). In general, the plans appear balanced within income group.

Table 10 contrasts predicted health status measures at exit for poor and nonpoor children. For example, the general health rating, among our most reliable and valid health status measures, does not vary significantly by plan, and the confidence intervals are quite tight. The only significant difference lies in anemia—where low-income children on the cost-sharing plan were significantly more likely to suffer from anemia at the conclusion of the study, as was suggested in our analysis of the poor at-risk sample. But given the number of statistical comparisons that we have made, one must guard against overinterpreting a single finding that is "significant."

Table 9

VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES FOR CHILDREN AGED 0-13 YEARS AT ENROLLMENT, BY INCOME LEVEL AND TYPE OF EXPERIMENTAL INSURANCE PLAN

Measures	Poor		Nonpoor	
	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans
Demographics				
No. of enrollees	187	367	270	590
Mean age (yr)	6.9	7.1	7.7	7.3
Sex (% male)	48.1	48.5	53.0	54.4
Race (% nonwhite)	49.2	61.8	8.7	6.6
Mean family income ($ 1982)	5574	6519	29,614	30,386
Mean education of mother (yr)	10.8	10.5	12.3	12.8
Study				
% taking physical screening exam	57.8	55.0	67.8	62.7
% enrolled for 3 years	71.7	69.5	71.1	65.1
Health				
Role limitations (%)	5.8	3.6	1.9	3.3
Mental health rating[a]	6.2	6.1	6.3	6.1
General health rating[a]	5.2	5.4	6.4	6.2
Anemia (%)	9.5	12.2	10.1	9.5
Hay fever (%)	7.1	4.4	10.9	11.7
Hearing loss (%)	5.7	10.5	7.8	4.5
Fluid in middle ear (%)	35.2	26.3	25.2	26.2
Functional far vision[b]	2.80	2.77	2.81	2.63

NOTE: $p < 0.05$ contrast free plan versus cost-sharing plans.
[a]0-10 scale; a higher value denotes better health.
[b]In Snellen line values 2 = 20/20, 3 = 20/25, 4 = 20/30.

Effect of Maximum Out-of-Pocket Payment

It appears that cost sharing generally did not affect the health of poor children any more than it affected the health of average children. This may have been because poor families cut expenditures less than wealthier families in response to the HIE's cost-sharing provisions. One reasons poor familes did not respond more to cost sharing was that the required maximum out-of-pocket payment was defined as a percentage of family income (5, 10, or 15 percent), up to a maximum of $1000. Thus, low-income families were eligible to receive free care after spending a smaller amount than high-income families had to spend to receive full reimbursement. Table 11 shows that the percentage of families exceeding the cap and receiving free care for part of the

Table 10

PREDICTED EXIT VALUES OF HEALTH STATUS MEASURES FOR CHILDREN, BY MEASURE, PLAN, AND INCOME

	Poor			Nonpoor		
Health Status Measure	Free Plan	Cost-Sharing Plans	Free Minus Cost Sharing[a]	Free Plan	Cost-Sharing Plans	Free Minus Cost Sharing[a]
Health Perceptions						
Role limitations (%)	2.45	3.97	−1.52(−4.58,1.54)	2.58	2.25	0.33(−1.61,2.27)
Mental health rating[b]	5.57	5.90	−0.33(−0.75,0.09)	5.89	5.88	0.01(−0.34,0.36)
General health rating[b]	5.46	5.39	0.07(−0.27,0.41)	5.40	5.49	−0.09(−0.33,0.15)
Physiologic Measures						
Anemia (%)	1.47	4.59	−3.12*(−6.01,−0.23)	2.10	1.37	0.73(−0.99,2.45)
Hay fever (%)	14.94	7.97	6.97(−1.02,14.96)	20.00	15.89	4.11(−2.98,11.2)
Hearing loss (%)	9.04	13.06	−4.02(−9.98,1.94)	10.80	7.09	3.71(−0.43,7.85)
Fluid in middle ear (%)	24.38	24.54	−0.16(−9.33,9.01)	25.76	25.92	−0.16(−7.80,7.48)
Functional far vision[d]	2.64	2.69	−0.05(−0.29,0.19)	2.56	2.64	−0.08(−0.25,0.09)

[a]95 percent confidence intervals in parentheses; approximate confidence intervals for dichotomous indicator variables.

[b]0-10 scale; a higher value denotes better health.

[c]Statistically significant $p < 0.05$.

[d]In Snellen line values 2 = 20/20, 3 = 20/25, 4 = 20/30.

year increases with the level of cost sharing. Within any cost-sharing level, families whose income was low enough that they were not subject to the maximum dollar expenditure or MDE ($1000 per year) were more likely to exceed their cap. About 41 percent of low-income families on the 95 percent coinsurance plans exceeded the cap. Thus, a sizable percentage of low-income families received free care for part of the year.

Analyses of expenditures by families who exceed the cap indicate that after they exceed the cap, families use care for acute conditions at a higher rate than they did before exceeding the cap. Indeed, use of nonacute services after exceeding the MDE nearly matches the free plan rate. The income-related cap thus partially offset the effect of coinsurance for low-income families; without an income-related maximum payment, the poor might have reduced expenditures by a greater percentage than high-income families as coinsurance rose. The additional care received may explain why we did not see greater differences by insurance plan in health status among poor children.

CONCLUSION

From these analyses it appears that the poor were effectively shielded from excessive cost sharing by the HIE plans. The HIE experience encourages us to believe that it is possible to design insurance plans that do shield the poor from excessive cost sharing yet preserve the incentive to discourage unnecessary expenditures without adversely affecting health. Moreover, to our knowledge, no one has proposed plans in which the poor would be required to spend a large share of their incomes for medical care. (A full discussion of the policy implications of our findings is given in Sec. V.)

Table 11

PERCENTAGE OF FAMILIES EXCEEDING MDE, BY PLAN AND INCOME

Plan	Low Income (Below MDE)	High Income (MDE)
25% coinsurance	33.8	11.2
50% coinsurance	25.9	18.4
95% coinsurance	41.4	27.3

V. DISCUSSION OF HEALTH STATUS FINDINGS AND IMPLICATIONS FOR INSURING CHILDREN'S HEALTH SERVICES

In this section we summarize our conclusions and some possible reasons why we found what we did and discuss some limitations on the applicability of our results. We also discuss the implications of our findings for possible changes in financing children's health care. The latter is prefaced by a description of the present status of children's insurance coverage.

INTERPRETATION OF RESULTS AND LIMITS ON THEIR APPLICABILITY

Some government and private sector actions to curb per capita use of medical services rely on cost sharing in the form of greater coinsurance and deductibles. Those in favor of cost sharing claim that such provisions prevent the purchase of care that provides little or no benefit. Opponents of cost sharing argue that the resulting decreased access to medical care adversely affects health. To a great extent, the attractiveness of cost sharing as a policy instrument depends on its potential to reduce expenditures without producing unacceptable health effects.

Interim use results from the HIE (Leibowitz et al., 1985) indicate that per capita child expenditures on the free plan were one-third higher than on the 95 percent cost-sharing plan. All measures of outpatient use examined—probability of seeing a physician, annual expenditures, visits, and episodes of treatment—show an increase in use as the level of cost sharing declines. Lower use of ambulatory care by children on the cost-sharing plans, however, did not increase hospital use on those plans.

The structure of our insurance plans guaranteed all medical care free after a family surpassed an annual maximum out-of-pocket expenditure. Because this MDE was income-related, poor families were more likely than affluent ones to exceed the annual limit. As a result we saw little relationship between use and family income. In insurance plans not tied to income, cost sharing might be expected to affect the use of services of poor children to a greater extent than we observed, and might adversely affect their health.

Two conclusions can be drawn concerning the influence of the difference in cost sharing and use of ambulatory care on the health of children.

First, receiving free care as opposed to having to pay a portion of the medical bill made no difference in physiologic function or in perceived physical, mental, or general health for the typical child. Furthermore, our confidence intervals were so narrow that even the largest difference with a reasonable likelihood of occurrence would have been quite small in clinical terms.

Second, no significant differences were observed among children at risk of having or developing illness. In this case, however, confidence intervals were in some comparisons sufficiently wide to include clinically important differences. For instance, among children we classified as the "poor sick," the difference in anemia prevalence could be as large as 31 percentage points. The potential difference in the general health rating was big enough to approximate the effect of suffering from hay fever.

The effect on anemia, however, is observed in analyses of all children from lowest-income households in which confidence intervals are narrowed further, suggesting that increased access may provide some benefit to the poor. Many poor children receive care through the Medicaid program. We cannot comment on any possible effect or lack of effect of Medicaid on children's health, as our insurance plans differed from Medicaid programs in at least two important ways. First, families served by Medicaid often face restrictions in provider choice because many providers do not accept Medicaid assignments. Families on our insurance plans obtained care from the providers of their choice. Second, Medicaid benefit packages vary considerably from state to state. Our plans covered a full range of services with only minor exclusions.

Future analyses will examine the use of services in more detail, as well as the quality of care provided to children. This work should provide information about why the increased use of services with free care seemingly provided so little benefit. For now, we offer two observations.

First, most children in a general population are healthy on a variety of measures (Eisen et al., 1980). Only 3 percent of children experienced restrictions in their usual activities; fewer than 10 percent suffered from most chronic problems such as anemia or hay fever.[1] Fewer

[1]However, roughly 30 percent of the children in our study had difficulty with their functional vision (vision with usual correction) on both the free care plan and the cost-sharing plans. Some of these visual difficulties may have been recognized by parents or physicians who decided to wait before attending to them. Some portion, however, may

than 2 percent of children under the age of 18 used any mental health service (Wells et al., 1982). Thus, the potential overall benefit of additional medical care appears limited.

Second, many physician visits were for acute care, and it appeared that such visits may have accounted for some of the difference in service use between plans. Preliminary work indicates, for example, that on the free plan there were 23 episodes of treatment per 100 children per year for upper respiratory infections compared with 12 on the cost-sharing plans ($p < 0.05$). At least some of the acute-care visits may not have had a long-lasting effect on health.

Our results must be used with caution in deriving policies for seriously chronically ill or disabled children or children with serious conditions we did not include in our physiologic measures. Although included in our experiment, they constitute only a small fraction of our sample. Thus, we have not attempted to describe the effects of cost sharing on this special group of children.

Nonetheless, we believe that our conclusions are generalizable to the population of U.S. children in the groups we did study. The HIE plans included a wide spectrum of cost sharing—from free care to a $1000 family deductible. Although the free plan is more generous than most existing plans, our cost-sharing plans closely resemble copayment levels in available insurance plans. For example, in our 95 percent plans, families paid 76 percent of their children's medical bills, whereas those on the other plans paid about 45 percent of their bills. On average families on coinsurance plans paid 66 percent of their children's medical expenses. Nationally, families shoulder 71 to 75 percent of the outpatient care costs for children (Rossiter and Salomon, 1981).

The HIE plans did differ from available insurance plans in three respects: They provided a more complete benefit package (Brook et al., 1984), they were considerably easier to understand (Marquis, 1981), and the maximum out-of-pocket expenditures were related to family income level. Although relating an expenditure cap to family income differs from customary practice, maximum expenditure caps are a common feature of health insurance plans; about half of existing group major medical insurance plans have out-of-pocket limits of $1000 or less (Health Insurance Association of America, 1984). Thus, we believe one can generalize the results based on our plans.

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result from inadequate problem recognition by either the parent or the physician or from poor problem followup.

LIMITS OF THE EXPERIMENT

We observed in the HIE that variations in coinsurance induced variation in use of medical care services. Decreasing coinsurance from 95 to 0 percent increased consumption of medical services by about one-third. Whether this induced increase in use of services affected children's health can best be answered using experimental data such as that generated by the HIE, because in other data families are not randomized to insurance plans and there is little variation in coverage. As with any study, however, the experimental data cannot settle the issue definitively but they offer the best opportunity to learn about the relationship between insurance and health status.

Although this experiment offers the best opportunity to study this relationship, no experiment or study perfectly addresses an issue. The HIE is no exception. Caution should be used in interpreting our results because several design and health status measurement issues remain.

Design Issues

The experiment was designed to examine insurance variation effects in the general non-aged population. Thus, by design the experiment does not directly focus on the most vulnerable subgroups of the population. Members of these subgroups were included in our study sample but, because they represent a small minority in a general population, estimates of insurance effects on the subgroup are imprecise. sizes. The experiment enrolled 1844 children ages 0-13 years into the fee-for-service study. Including more children would have permitted the experiment to more precisely analyze the effects on special populations of interest including the very young, the chronically ill, and the poor.

Specific aspects of implementing the experimental treatment may have reduced our chances of observing differences in health status. Seventy percent of enrolled children participated in a medical screening examination. Results of this screening were sent to their usual provider. We are currently examining what effect the screening examination played in our health results.

Our insurance plan structure may also have diluted the effects of cost sharing particularly among the lower-income families. Our plans tied maximum expenditure limits to family income. Our results show that about 40 percent of the low-income families received care free for a portion of the year as a result of exceeding the MDE. This effect of insurance plan structure must be taken into account in assessing the effects of coinsurance variation on the health of this vulnerable group.

Health Status Measurement Issues

Although the HIE has made major contributions to measuring children's health, numerous measurement issues require our continued attention. The HIE was not able to assess the effect on short-term transitory conditions. The conditions examined in the HIE did not include upper respiratory infections and gastrointestinal problems that generally are acute and self-limiting but represent two of the major reasons for visits to the physician. The relief of transitory worry by the parent via physician reassurance was not examined.

The HIE relied on two sources of data on children's health: a medical screening examination and parental perceptions. The first source was limited by the availability of appropriate and reliable screening tests. Parental perceptions of a child's health may suffer from subjective reporting bias. This problem could have been overcome by combining information from a variety of sources including physician interviews, school reports, and direct observation.

Additional work is required to fully understand the Rand general health perception measures. A thorough evaluation of a set of measures requires evidence of several different kinds including practical considerations, methods of scale construction and calibration, reliability, the level of validation demonstrated, and precision for purposes of testing specific hypotheses. Eisen et al (1980) report details of the scaling, reliability, and content validity of our measures. These studies suggested that our measures were adequate for testing hypotheses about the effects of cost sharing on health. Further demonstrations of the empirical validity of these measures are needed, including examining the predictive validity of these measures with regard to health service use and a detailed examination of actual changes in health status observed in the experiment. Additional health status measures remain unexamined and could shed additional light on the relationship between insurance and health status.

INSURANCE COVERAGE OF CHILDREN[2]

Before considering the implications of the HIE results for children's health insurance, a review of children's health insurance status is in order.[3] A detailed discussion of this topic can be found in Appendix G.

[2]This topic is discussed in more detail in Appendix G.

[3]Health insurance schemes were based on casualty insurance schemes that assumed insurance was appropriate only when three conditions were met: (1) The event or risk insured against is relatively rare for the individual but occurs at known rates for groups, (2) the event is very costly, and (3) the event cannot be controlled by the insured indi-

Health insurance status has two distinct facets. The first is the percentage of individuals who are insured. The second is the nature of the services covered by the benefit package.

As of 1977,[4] 82 percent of U.S. children (under 19) were covered by health insurance year-round. About 70 percent were covered by private insurance alone, the remaining 12 percent by public insurance or a combination of public and private. Looking at it another way, about 30 percent of U.S. children were either uninsured or depended on public health insurance programs. Slightly less than half of those (12.8 percent of total population) were without any insurance for part or all of the year, whereas the other half (16.9 percent of total population) were covered by public insurance programs for all or part of the year (Walden, et al., 1985).

Children's health insurance coverage or lack of coverage results from the insurance status of their family (Monheit et al, 1984). If an adult

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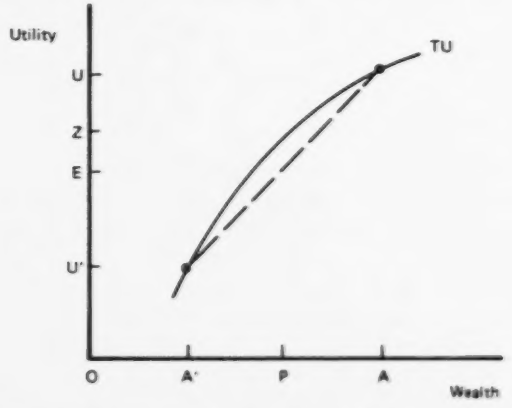
vidual. Thus, families acquire health insurance to guard against an uncertain but potentially large financial loss by insuring a certain small loss of income (purchasing an insurance policy). This purchase benefits the family if greater financial loss causes larger declines in utility (there is diminishing marginal utility to wealth). The families utility function will look similar to that shown below.



Assume a family starts at position OA with utility U. A loss would move the family from A toward the origin O. Suppose the family faces the possibility of a loss to position OA'. If the probability of the loss is 0.5 then without insurance, the family will expect a utility level of OU' half the time and OU the other half. Thus, the expected utility is the average OE. If the family buys insurance, costing PA, then the family has utility OZ and wealth OP. Therefore, the family is financially better off buying insurance.

[4]The year of the most recent available data. Present coverage is likely to be similar, because the proportion of the under-65 population that holds private insurance did not change significantly between 1977 and 1983 (Gibson, 1984). Cutbacks in Medicaid since 1977, however, could have reduced the proportion who are covered publicly for all or part of the year.

member of the family is covered, then the children are usually covered. Children with private insurance for only part of the year are likely to be from families in which coverage has lapsed for any of a variety of reasons. The parents may have been unemployed for part of the year or may not have been employed long enough to qualify for insurance benefits. Children with public coverage for part of the year but no other coverage are likely to come from families in which the parent remained unemployed long enough and was poor enough to become eligible for Medicaid at some time during the year. Children with no coverage for the entire year generally come from families where the parent or parents are working but do not have health insurance as a benefit of employment or have insurance for themselves but not for family members.

In assessing the health insurance status of children we must also consider the structure of the benefits that children receive. Much of the medical care for both acute problems and preventive care occurs on an ambulatory basis in physician's offices and clinics. To the extent that health insurance is less likely to cover ambulatory care, children are less well covered by insurance than other age groups. Thus, insured children can be covered for a narrow to a wide range of services. For instance, although 73 percent of children 0–6 and 77 percent of those 6–18 are covered for inpatient services, only 62 percent and 66 percent, respectively, are covered for office visits, and only 40 percent and 43 percent for out-of-hospital services (Farley, 1985).

Most insurance policies have limits of various types on how much of a benefit the policy will cover. Deductibles, coinsurance, and other cost-sharing provisions are common features of health insurance plans. These cost-sharing provisions are put together in a wide variety of arrangements among private health insurance plans. Some insurance plans have limits on the amount of a service that is covered and many have total expenditure limits. Many policies do not cover or may exclude preventive services. For example, only 3 percent of insurance plans held by HIE participants before enrolling explicitly stated they covered preventive services. Seventeen percent did not cover outpatient services at all, whereas 48 percent covered some ambulatory care, but not preventive care.

Two conclusions are readily apparent from all of this. First, cost sharing thus plays a major role in children's medical care. Second, children are less well covered for services they are more likely to use including office visits and preventive services.

IMPLICATIONS FOR CHANGING CHILD CARE HEALTH FINANCING

The American Academy of Pediatrics Committee on Child Health Financing has called for reforms in health care financing to eliminate "financial barriers" and broaden the range of services covered to include preventive care (Committee on Child Health Financing, 1983). The HIE use and health outcome results have implications for the design of new financing mechanisms for the provision of necessary medical care for children. We begin our discussion by examining some approaches to health care financing that have been proposed, then summarize the possibilities in terms of two pairs of coverage tradeoffs for a more systematic analysis.

Different Approaches to Health Financing

Using the health measures we have examined thus far, we conclude that providing all medical services free to all children is not justified by the health benefits realized. A case for free care, however, could be made on the grounds of equity. In particular, cost-sharing plans require those who need treatment for serious illnesses to shoulder more of the burden of financing their medical care. This may be regarded as unfair to such individuals. Whether this case for free care sufficiently justifies its costs must, of course, be answered by the wider society.

If on the basis of cost considerations and health outcomes free care for all children is not justified then what financial arrangements can be made to provide children necessary medical care? For those who believe the current structure of benefits appropriate, the question may be simply one of finding the appropriate level of cost sharing for children's medical care that reduces the inefficiencies of allocation. Inefficiencies in allocation result from a lowering of price to the point that consumption leads to the use of additional services that the consumer would not buy if he or she were paying the full price out of pocket. For others such as the Pediatric Committee on Health Care Financing who believe that the benefit packages do not adequately cover necessary services and inhibit use, the question is more complex than just changing the level of cost sharing in health plans.

For some in the medical field the ideal arrangement is captured by the notion of comprehensive care. Comprehensive care has meant many things to many people but several major threads are commonly present. First, an important element of comprehensive care is the availability and access to a broad range of services. Second, there is an interrelationship of continuity and coordination of services. Third, a

comprehensive care orientation emphasizes preventive and anticipatory approaches with concern for the whole person. It is not at all clear, however, that comprehensive benefits are necessarily related to comprehensive care.

There appear to be at least three major reasons for providing less than comprehensive benefits. First, the public appears unwilling to bear the high cost of medical care associated with more generous insurance packages. Second, the high cost of covering small recurrent expenses and the traditional concerns for actuarial soundness affect what is considered an insurable hazard. Third, certain benefits may not be socially acceptable and are likely to be excluded as a result.

Two Tradeoffs

Most of the current concerns about the quality of health insurance for children can be expressed in two basic tradeoffs. The first, can be framed as follows: Do we develop better, more generous benefit packages for the insured or seek to guarantee insurance for the uninsured or partially insured? The second concerns the restructuring of benefit packages: Should benefit packages provide a limited number of services identified as necessary services with no copayment provisions or should all types of services be covered with copayment?

With respect to the first, it has been argued that children's use of services is more responsive to insurance than that of adults. Our results on annual expenditures (Leibowitz et al, 1985) show that expenditures for children are no more responsive to insurance coverage than those of the general population. In fact, children's annual expenditures are slightly less responsive to cost sharing than those for adults. Because of lower costs of care children spend only 39 percent of the non-aged adult level. A greater share of children's services, however, is for ambulatory care. We have seen that ambulatory care is less well covered, perhaps because such total expenditures are smaller and fairly predictable. Insurance, therefore, plays a lesser role in protecting families from financial ruin. Our results are not sufficient to justify a particular level of cost sharing. However, it is clear from our results that more generous insurance coverage for the typical child will increase consumption of medical services but provide little or no additional benefit beyond currently available coverage.

Our results cannot be used to generalize about the uninsured. We have no data in our study on the effect of becoming uninsured, only data on the effects of alternative levels of cost sharing. Other data persuade us that losing eligibility for public or private insurance could have quite a large effect on health (Lurie et al, 1984). One could ask

how large cost sharing must be before negative effects would become pronounced. To estimate this value would require us to go beyond our observed data. But we can say that the recent upsurge of deductibles in employer-based insurance (e.g., from $100 to $200 per person per year) (Goldsmith, 1984) is unlikely to importantly damage the health of the average child insured under such plans.

We now turn to the restructuring of benefit packages. Although the structure of our insurance plans' packages do not allow us to comment on the inclusion or exclusion of specific services, our results do allow us to comment on the use of preventive services and hospitals. The current low level of coverage for preventive services results from the belief that only nondiscretionary services should be covered by insurance. Leibowitz et al. (1985) show that children on cost-sharing plans had significantly fewer treatment episodes than children on the free care plan. Cost sharing reduced episodes of well care less than it reduced care for acute or chronic problems. We, therefore, have no evidence that well care is more discretionary than other types of care. Because preventive care appears no more discretionary than acute care, there is no reason to provide less coverage on this account. One could argue, however, that preventive care is predictable and thus insurance is unwarranted.

We also saw that children's use of hospitals was not significantly affected by cost-sharing provisions. This lack of response implies that generous coverage of hospital care would not stimulate hospital use for children. Might not more generous hospital coverage lead to a delaying of seeking care or substitution of hospital for outpatient care? This notion is not supported by results from our individual deductible plan, which provided inpatient services free but imposed a 95 percent coinsurance for ambulatory care (Leibowitz et al., 1985). Children on this plan had significantly lower annual expenses than children with free medical care. These children appear no less healthy than children on other plans. Thus, insurance packages could completely cover the costs of inpatient care for children without stimulating excessive use.

CONCLUSION

The National Commission on the Cost of Medical Care recommended that "insurance policies should include provisions through which the consumer shares in the cost of care received, at the time of service, for selected benefits and for selected groups . . . ." In supporting statements the Commission further states, "It is important that care be taken to provide a proper balance between price disincentives designed to discourage unneeded or unnecessarily expensive care and

insurance incentives designed to encourage the use of needed and appropriate care. Further, cost sharing should be tailored to meet the needs of low income families." (National Commission, 1977). The HIE results greatly encourage us to believe that it is possible to design insurance plans that shield the poor from excessive cost sharing and preserve demand-reducing incentives for a non-aged general population without producing unacceptable health effects.

Appendix A

RESULTS OF ANALYSES OF COMPLETE DATA OBSERVATIONS

INTRODUCTION

The Rand HIE was designed to examine the effects of insurance plans that differed by level of cost sharing. To ease exposition and understanding of a complex investigation without altering the conclusions or implications of our findings we presented contrasts of health status for children on the free plan and all those assigned to cost-sharing plans. This section documents effects estimated for each of the cost-sharing plans and justifies combining the cost-sharing plans for expository concerns. First we present demographic, experimental, and health status values at enrollment. Then we present simple means of health outcomes by plan followed by estimates of plan effects based on regression methods.

METHODS

The sample used in each of these analyses was a complete data observation. No adjustments were made to the data for missing information. These analyses allow us to compare results derived with and without correction for missing enrollment health status data.

Regression methods were used to estimate the influence of explanatory variables on a variety of dependent variables that measure health status at exit. In particular, the effects of insurance plan generosity were contrasted against the free plan.

RESULTS

Table A.1 presents enrollment values for all the variables used in these analyses and baseline health utilization information. Few statistically significant demographic differences are found among the various insurance plans. This is as expected because families were randomly assigned to insurance plans so that the distribution of family characteristics was as similar as possible. The only difference of note is that children on the 50 percent cost-sharing plan have family incomes that are slightly higher than those on the other plans. It should also be

noted that this is the smallest of our plans because no 50 percent plan was fielded in the Seattle site.

Means and proportions of health status measures for enrollment and exit are presented in Table A.2. Sample sizes for each of the health status measures are dissimilar because the number of children included in each health status measure differs because of age restrictions or missing data.

At enrollment we find few differences across the insurance plans. Because of the small number of children in the 50 percent plan, what appears to be unusually high proportions of children identified as anemic and so few children with fluid in the middle ear on the 50 percent cost-sharing plan results from the small sample of children examined on this plan. In general, the children on all plans started the experiment with similar levels of health status.

Upon exit from the study, three or five years after enrollment, no distinct pattern in health status across the insurance plans is observed. No discernible differences can be observed across the plans. Moreover, these standard errors are too low because they do not account for intrafamily correlations. Our best measure of overall health status, the

Table A.1

VALUES OF DEMOGRAPHIC STUDY OF CHILDREN AGED 0-13 AT ENROLLMENT, BY TYPE OF INSURANCE PLAN

Variable and Brief Description	Individual Deductible	95% Plan	50% Plan	25% Plan	Free Plan
No. of enrollees	391	357	125	372	599
Mean age (yr)	6.95	7.29	7.27	7.35	7.07
Sex (% male)	49.6	54.3	48.8	51.9	52.3
Race (% nonwhite)	25.6	27.0	16.0	24.4	21.3
Mean family income adjusted for family size ($ 1982 thousands)	9.12	9.12	9.29*	9.21	9.10
Mean education of mother (yr)	11.8	11.9	12.0	11.9	11.8
% of children hospitalized in year before enrollment	8.67	7.27	6.67	5.31	7.53
Mean no. of physician visits in year before enrollment	3.37	2.74	3.39	3.13	3.34
% taking physical screening exam	60.1	60.8	52.0*	60.8	64.1
% enrolled for 3 years	77.5*	72.0	60.8	62.1	68.6

*$p < 0.05$ contrasted against free plan.

Table A.2

RAW MEANS FROM REGRESSION SAMPLES OF NONMISSING DATA

Variable	Free Plan	Cost-Sharing Plans	t-Test
	Enrollment		
SQRMHI0	6.16	6.15	−0.052
SQRGHI0	5.93	5.95	0.167
ROLELIM0 (%)	2.74	2.93	0.203
BINSTAT (%)	0.08	0.10	0.981
HAYFCURT (%)	0.12	0.10	−0.875
BLINFUNF	2.81	2.73	−0.728
BINIHEAR (%)	0.086	0.046	−1.972[a]
BIN30TMD (%)	0.33	0.27	−1.01
	Exit		
SQRMHIX	5.79	5.88	0.767
SQRGHIX	5.61	5.65	0.339
ROLELIMX (%)	2.74	3.35	0.62
BINSTATX (%)	0.021	0.027	0.680
HAYCURTX (%)	0.19	0.15	−1.652[b]
BLNFUNFX	2.68	2.72	0.505
BINIHERX (%)	0.113	0.096	−0.963
BIN30TMX (%)	0.32	0.32	−0.10

[a] $p < 0.05$.
[b] $p < 0.10$.

general health rating index, shows no significant differences across the plans. These data support our decision to aggregate the cost-sharing plans.

The next subsection presents the estimated regression models estimated from the sample of observations with complete information. Each health status measure was estimated using contrasts of the individual deductible, 95 percent cost-sharing plan and a combined 50 percent and 25 percent cost-sharing plans against the free plan. The cost-sharing plans were then collapsed into a single set of cost-sharing plans and contrasted against the free plan. Using this specification with income centered at the mean income by plan, interactions were evaluated.

No statistically significant differences were observed across the insurance plans for the eight health status measures evaluated. We did not observe a monotonically increasing level of good health as cost-sharing requirements declined. Nor did we observe differences between

those who were required to share costs and those who received free medical care. No income by insurance plan interactions were observed at conventional statistical levels. The only contrast that approached conventional levels was observed for hay fever, suggesting that children of higher-income families on any plan were more likely to be identified as having hay fever.

These data support our decision to present results using free plan/cost-sharing plans comparisons. These comparisons ease exposition considerably without loss of information.

ESTIMATED REGRESSION MODELS

Table A.3

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: GENERAL HEALTH PERCEPTIONS, ALL PLANS CONTRAST

Variable	OLS Coeff.	t-Test
INTERCEPT	3.701	3.74
SQRGHIO	−0.381	12.94
DUM1X4	−0.406	−1.68
DUM1X5	−0.162	−0.84
DUM2X6	−0.816	−4.34
DAYENRV	0.005	0.04
DAYTON	−0.624	−1.17
FITCH	−0.055	−0.29
FRANK	−0.185	−1.01
CHARLES	−0.013	−0.05
GEORGE	−0.224	−0.95
NONWHITE	−0.195	−1.13
AGE	−0.028	−1.20
LESSHS	−0.223	−1.71
SOMECOL	−0.207	−1.35
COLLG	0.269	1.56
TERM3	0.032	0.25
TOOKPHYS	−0.146	−1.30
TINC	0.062	0.60
MALE	−0.086	−0.83
HRTYPE	−0.074	−0.44
95ID	−0.059	−0.40
95P	0.065	0.42
5025P	0.019	0.14

R-squared = 0.2000.
Sample size = 1484.

Table A.4

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: GENERAL HEALTH PERCEPTIONS, FREE VS. COST-SHARING CONTRAST I

Variable	OLS Coeff.	t-Test
INTERCEPT	3.715	3.76
SQRGHI0	0.381	12.94
DUM1X4	−0.405	−1.67
DUM1X5	−0.155	−0.80
DUM2X6	−0.811	−4.32
DAYENRV	0.007	0.05
DAYTON	−0.061	−1.15
FITCH	−0.058	−0.30
FRANK	−0.187	−1.02
CHARLES	−0.012	−0.05
GEORGE	−0.229	−0.98
NONWHITE	−0.192	−1.11
AGE	−0.028	−1.18
LESSHS	−0.221	−1.68
SOMECOL	−0.196	−1.29
COLLG	0.272	1.57
TERM3	0.032	0.26
TOOKPHYS	−0.145	−1.30
TINC	0.060	0.57
MALE	−0.085	−0.82
HRTYPE	−0.074	−0.44
COINS	0.007	0.06

R-squared = 0.1996.
Sample size = 1484.

Table A.5

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: GENERAL HEALTH PERCEPTIONS, FREE VS. COST-SHARING CONTRAST II

Variable	OLS Coeff.	t-Test
INTERCEPT	4.304	3.23
SQRGHI0	0.382	12.96
DUM1X4	−0.406	−1.67
DUM1X5	−0.153	−0.79
DUM2X6	−0.809	−4.31
DAYENRV	0.005	0.04
DAYTON	−0.603	−1.13
FITCH	−0.054	−0.28
FRANK	−0.187	−1.02
CHARLES	−0.006	−0.02
GEORGE	−0.222	−0.95
NONWHITE	−0.186	−1.07
AGE	−0.028	−1.18
LESSHS	−0.211	−1.59
SOMECOL	−0.195	−1.28
COLLG	0.269	1.56
TERM3	0.036	0.28
TOOKPHYS	−0.148	−1.32
TINC	−0.061	−0.04
MALE	−0.085	−0.83
HRTYPE	−0.071	−0.42
INCXCOIN	0.115	0.66
COINS	−1.052	−0.65

R-squared = 0.1999.
Sample size = 1484.

Table A.6

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: MENTAL HEALTH PERCEPTIONS, ALL PLANS CONTRAST

Variable	OLS Coeff.	t-Test
INTERCEPT	2.819	2.83
SQRGHI0	0.439	11.16
DUM1X4	−0.458	−2.64
DAYENRV	−0.097	−0.35
DAYTON	0.118	0.12
FITCH	0.053	0.29
FRANK	0.025	0.14
CHARLES	0.585	2.51
GEORGE	0.074	0.33
LFAMSIZE	−0.112	−0.66
NONWHITE	−0.183	−1.11
AGE	−0.034	−1.22
LESSHS	−0.005	−0.04
SOMECOL	−0.183	−1.19
COLLG	0.072	0.43
TERM3	0.104	0.87
TOOKPHYS	0.158	1.46
TINC	0.074	0.75
MALE	0.034	0.35
HRTYPE	0.018	0.11
95ID	−0.016	−0.11
95P	0.202	1.40
5025P	0.104	0.81

R-squared = 0.2200
Sample size = 1026.

Table A.7

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: MENTAL HEALTH PERCEPTIONS, FREE VS. COST-SHARING CONTRAST I

Variable	OLS Coeff.	t-Test
INTERCEPT	2.789	2.79
SQRGHI0	0.440	11.20
DUM1X4	−0.445	−2.57
DAYENRV	−0.084	−0.30
DAYTON	0.096	0.09
FITCH	0.043	0.23
FRANK	0.013	0.08
CHARLES	0.584	2.51
GEORGE	0.062	0.28
LFAMSIZE	−0.094	−0.56
NONWHITE	−0.177	−1.07
AGE	−0.034	−1.23
LESSHS	0.0009	0.01
SOMECOL	−0.167	−1.09
COLLG	0.075	0.45
TERM3	0.108	0.91
TOOKPHYS	0.162	1.50
TINC	0.072	0.74
MALE	0.036	0.37
HRTYPE	0.016	0.11
COINS	0.094	0.88

R-squared = 0.2180.
Sample size = 1026.

Table A.8

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: MENTAL HEALTH PERCEPTIONS, FREE VS. COST-SHARING CONTRAST II

Variable	OLS Coeff.	t-Test
INTERCEPT	1.547	1.18
SQRGHI0	0.438	11.18
DUM1X4	−0.455	−2.63
DAYENRV	−0.105	−0.38
DAYTON	0.175	0.16
FITCH	0.037	0.20
FRANK	0.015	0.08
CHARLES	0.572	2.45
GEORGE	0.043	0.19
LFAMSIZE	−0.076	−0.45
NONWHITE	−0.195	−1.18
AGE	−0.033	−1.21
LESSHS	−0.018	−0.15
SOMECOL	−0.167	−1.10
COLLG	0.079	0.47
TERM3	0.098	0.82
TOOKPHYS	0.168	1.55
TINC	0.208	1.53
MALE	0.036	0.37
HRTYPE	0.011	0.07
INCXCOIN	−0.238	−1.45
COINS	2.277	1.51

R-squared = 0.2203.
Sample size = 1026.

Table A.9

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: ROLE LIMITATIONS, ALL PLANS CONTRAST

Variable	Logit Coeff.	t-Test
INTERCEPT	−1.905	−0.85
ROLELIM0	2.454	5.60
ROLEDUM4	−0.424	−0.57
ROLEDUM6	0.352	0.99
MALE	−0.809	−2.47
TERM3	0.557	1.52
TINC	−0.215	−0.88
95ID	0.271	0.62
95P	−0.957	−1.47
5025P	0.527	1.39

Loglikelihood ratio = 20.07.
Sample size = 1430.

Table A.10

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: ROLE LIMITATIONS, FREE VS. COST-SHARING CONTRAST I

Variable	Logit Coeff.	t-Test
INTERCEPT	−1.890	−0.86
ROLELIM0	2.479	5.75
ROLEDUM4	−0.347	−0.47
ROLEDUM6	0.319	0.90
MALE	−0.805	−2.46
TERM3	0.455	1.26
TINC	−0.208	−0.87
COINS	0.181	0.53

Loglikelihood ratio = 16.37.
Sample size = 1430.

Table A.11

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: ROLE LIMITATIONS, FREE VS. COST-SHARING CONTRAST II

Variable	Logit Coeff.	t-Test
INTERCEPT	−5.519	−1.33
ROLELIM0	2.538	5.83
ROLEDUM4	−0.334	−0.45
ROLEDUM6	0.312	0.88
MALE	−0.792	−2.42
TERM3	0.452	1.25
TINC	0.188	0.42
COINS	5.736	1.17
INCXCOIN	−0.608	−1.14

Loglikelihood ratio = 17.07.
Sample size = 1430.

Table A.12

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: ANEMIA STATUS, ALL PLANS CONTRAST

Variable	Logit Coeff.	t-Test
INTERCEPT	4.926	2.06
BINSTAT	2.053	4.29
TINC	−1.052	−3.85
95ID	0.879	1.40
95P	0.825	1.28
5025P	0.346	0.51

Loglikelihood ratio = 15.87.
Sample size = 861.

Table A.13

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: ANEMIA STATUS, FREE VS. COST-SHARING CONTRAST I

Variable	Logit Coeff.	t-Test
INTERCEPT	5.066	2.12
BINSTAT	2.030	4.25
TINC	−1.067	−3.90
COINS	0.690	1.29

Loglikelihood ratio = 15.43.
Sample size = 861.

Table A.14

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: ANEMIA STATUS, FREE VS. COST-SHARING CONTRAST II

Variable	Logit Coeff.	t-Test
INTERCEPT	−0.604	−0.10
BINSTAT	1.999	4.16
TINC	−0.424	−0.67
COINS	8.122	1.28
INCXCOIN	−0.843	−1.19

Loglikelihood ratio = 16.29.
Sample size = 861.

Table A.15

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: HAY FEVER STATUS, ALL PLANS CONTRAST

Variable	Logit Coeff.	t-Test
INTERCEPT	−8.063	−3.47
HAYFCURT	2.700	7.09
FITCH	0.469	1.20
FRANK	−0.169	−0.44
CHARLES	−0.348	−0.68
GEORGE	−0.426	−0.98
EDUC	−0.106	−0.17
AGE	0.307	4.58
TINC	0.430	1.66
95ID	−0.212	−0.62
95P	−0.722	−1.60
5025P	−0.259	−0.72

Chi-squared = 125.64.
Loglikelihood ratio = 62.82.

Table A.16

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: HAY FEVER STATUS, FREE VS. COST-SHARING CONTRAST I

Variable	Logit Coeff.	t-Test
INTERCEPT	−8.108	−3.63
HAYFCURT	2.698	7.38
FITCH	0.460	1.23
FRANK	−0.154	−0.42
CHARLES	−0.368	−0.75
GEORGE	−0.418	−1.00
EDUC	−0.017	−0.28
AGE	0.310	4.82
TINC	0.440	1.77
COINS	−0.337	−1.25

Chi-squared = 124.21.
Loglikelihood ratio = 62.11.

Table A.17

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: HAY FEVER STATUS, FREE VS. COST-SHARING CONTRAST II

Variable	Logit Coeff.	t-Test
INTERCEPT	−4.103	−1.42
HAYFCURT	2.635	7.15
FITCH	0.506	1.34
FRANK	−0.167	−0.46
CHARLES	−0.332	−0.67
GEORGE	−0.373	−0.89
EDUC	−0.030	−0.51
AGE	0.308	4.79
TINC	0.019	0.06
COINS	−9.587	−2.05
INCXCOIN	1.003	1.99

Chi-squared = 130.6.
Loglikelihood ratio = 65.31.

Table A.18

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: FLUID IN MIDDLE EAR, ALL PLANS CONTRAST

Variable	Logit Coeff.	t-Test
INTERCEPT	−0.532	−0.22
BIN30TMD	2.019	7.02
DAYTON	0.052	0.07
FITCH	0.023	0.06
FRANK	−0.011	−0.03
CHARLES	−0.791	−1.13
GEORGE	0.348	0.74
NONWHITE	−0.364	−0.67
AGE	0.065	0.88
TINC	−0.295	−1.19
MALE	0.232	0.83
TERM3	1.421	3.35
95ID	−0.096	−0.27
95P	0.071	0.18
5025P	−0.534	−1.39

Chi-squared = 76.83.

Loglikelihood ratio = 38.42.

Table A.19

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: FLUID IN MIDDLE EAR, FREE VS. COST-SHARING CONTRAST I

Variable	Logit Coeff.	t-Test
INTERCEPT	−0.481	−0.20
BIN30TMD	1.999	7.01
DAYTON	−0.044	−0.06
FITCH	0.031	0.08
FRANK	−0.033	−0.09
CHARLES	−0.792	−1.15
GEORGE	0.306	0.65
NONWHITE	−0.328	−0.61
AGE	0.060	0.83
TINC	−0.297	−1.20
MALE	0.251	0.91
TERM3	1.427	3.39
COINS	−0.194	−0.67

Chi-squared = 74.66.

Loglikelihood ratio = 37.33.

Table A.20

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: BEST EAR HEARING LOSS, ALL PLANS CONTRAST

Variable	Logit Coeff.	t-Test
INTERCEPT	0.151	0.06
BINIHEAR	2.304	5.56
NONWHITE	−0.169	−0.34
AGE	0.056	0.84
TINC	−0.426	−1.61
95ID	0.062	0.12
95P	0.509	1.10
5025P	0.173	0.37

Chi-squared = 30.37.

Loglikelihood ratio = 15.19.

Table A.21

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: BEST EAR HEARING LOSS, FREE VS. COST-SHARING CONTRAST I

Variable	Logit Coeff.	t-Test
INTERCEPT	0.129	0.05
BINIHEAR	2.313	5.62
NONWHITE	−0.150	−0.19
AGE	0.055	0.83
TINC	−0.423	−1.61
COINS	0.251	0.68

Chi-squared = 29.58.

Loglikelihood ratio = 14.79.

Table A.22

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: BEST EAR HEARING LOSS, FREE VS. COST-SHARING CONTRAST II

Variable	Logit Coeff.	t-Test
INTERCEPT	−3.711	−0.99
BINIHEAR	2.316	5.59
NONWHITE	−0.297	−0.57
AGE	0.055	0.82
TINC	0.005	0.01
COINS	7.318	1.60
INCXCOIN	−0.782	−1.55

Chi-squared = 32.17.
Loglikelihood ratio = 16.08.

Table A.23

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: BEST EYE FUNCTIONAL FAR VISION, ALL PLANS CONTRAST

Variable	OLS Coeff.	t-Test
INTERCEPT	2.926	3.73
BLINFUNF	0.278	8.52
AGE	−0.056	−3.37
MALE	−0.135	−1.44
NONWHITE	−0.152	−1.10
TINC	−0.064	−0.79
95ID	0.014	0.10
95P	0.135	1.00
5025P	0.109	0.89

R-squared = 0.1435.
Sample size = 757.

Table A.24

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: BEST EYE FUNCTIONAL FAR VISION, FREE VS. COST-SHARING CONTRAST I

Variable	OLS Coeff.	t-Test
INTERCEPT	2.882	3.70
BLINFUNF	0.278	8.52
AGE	−0.056	−3.36
MALE	−0.133	−1.42
NONWHITE	−0.148	−1.08
TINC	−0.061	−0.75
COINS	0.087	0.88

R-squared = 0.1426.
Sample size = 757.

Table A.25

REGRESSION EQUATIONS FOR OBSERVATIONS WITH COMPLETE INFORMATION: BEST EYE FUNCTIONAL FAR VISION, FREE VS. COST-SHARING CONTRAST II

Variable	OLS Coeff.	t-Test
INTERCEPT	2.728	2.47
BLINFUNF	0.278	8.49
AGE	−0.056	−3.36
MALE	−0.133	−1.41
NONWHITE	−0.150	−1.09
TINC	−0.044	−0.37
COINS	0.365	0.26
INCXCOIN	−0.030	−0.20

R-squared = 0.1426.
Sample size = 757.

Appendix B

HEALTH STATUS MEASURES

Five conditions (anemia, hay fever, fluid in the middle ear, hearing loss, and visual acuity) provide physiologic information about children in the experiment. (Additional physiologic information was collected on the following conditions: cancer, convulsions, dental conditions, bedwetting, growth and development disorders, lead poisoning, and urinary tract infections. Data on dental conditions, oral health behavior, and growth and development are the subjects of forthcoming reports. The other conditions occurred too infrequently to provide reliable information.) The criteria used to evaluate each condition can be found in Table 1. These conditions were selected because they can be readily detected, are fairly prevalent, are amenable to medical treatment, and they have important adverse effects if left unattended.

ANEMIA

Anemia is not a disease in itself, but like fever provides a signal that a problem exists. Anemia refers to an abnormally low level of hemoglobin in the blood. It is the hemoglobin in the blood cells that transports oxygen to all parts of the body. A low level of hemoglobin can occur for a variety of reasons: loss of blood, insufficient supplies of iron or other nutrients needed to make hemoglobin, destruction of red blood cells within the body, or disease that prevents the body from replacing hemoglobin.

The reported prevalence of anemia varies widely. Using a hemoglobin concentration of 10.0 g/100 ml, the reported prevalence of anemia in children 6 months to 10 years ranges from 0.1 to 24.0 percent (Kessner and Kalk, 1973; Dutton and Silber, 1980; Dallman, 1981; CDC, "Nutrition Surveillance," 1981). Investigators have shown that anemia is strongly associated with a variety of environmental and family characteristics reflecting socioeconomic factors including dietary habits, income, and race (Lanzkowsky, 1974; Dutton, 1979).

Anemia produces few symptoms unless it is severe (less than 10.0 g/100 ml). The symptoms of anemia are fatigue, shortness of breath, dizziness, and palpitations.

The most common childhood forms of anemia are associated with having smaller than normal blood cells: iron deficiency anemia or

thalassemia minor (Rudolph, 1977). The proportion of anemia in the general population caused by iron deficiency exceeds that associated with other more unusual conditions (Dallman, 1981). Therefore, any low hemoglobin found in a general population survey such as the HIE is likely due to iron-deficiency rather than to chronic disease.

We used results from a blood test from the medical screening examination to assess whether a child suffered from anemia (Foxman et al., 1983). Blood was drawn from children 6 months and older. A finger prick was used for children younger than a year. Blood samples were analyzed on an automated Coulter Model S for hemoglobin, hematocrit, red blood cell count, mean cell volume, mean cell hemoglobin, and mean cell hemoglobin concentration. Serum iron and total iron binding capacity were assessed for children whose hemoglobin levels fell below normal limits at exit. Reference standards for hemoglobin based on values obtained with electronic counters on large healthy populations were adopted for use in the HIE with the following change: The lower levels of normal hemoglobin were defined as 0.5 g/100 ml lower than the reference levels to allow for the effect of diurnal variation in hemoglobin concentration. Diurnal variations as great as 15 percent have been reported in the literature (Dacie and Lewis, 1975). All blood samples were drawn after 11:00 a.m., and half were drawn in the evening hours. Thus, hemoglobin values would be expected to be systematically lower than values from other studies in which blood samples were drawn earlier in the day.

A child (6 months to 18 years) was defined as having anemia if his hemoglobin level fell below the following limits (grams per 100 ml of blood):

Both boys and girls:	6 months to 2 years	10.0
	2 years to 12 years	11.0
Boys only:	13 years to 18 years	12.0
Girls only:	13 years to 18 years	11.5

Two girls pregnant at the time of the screening examination were excluded from the anemia analyses.

HAY FEVER AND OTHER PLANT ALLERGIES

A noninfectious inflammatory disease of the nasal passages—hay fever or allergic rhinitis—is characterized by a variety of symptoms including congestion, hypersecretion, sneezing, and itchy eyes, nose, and throat. The intensity of these symptoms varies from day to day.

Hay fever like asthma may be caused by allergic or nonallergic factors. Some of the allergens suspected of causing hay fever include: mold spores, pollens, and animal dander. Nonallergic hay fever may be the result of infections or psychosomatic processes.

Hay fever affects children either seasonally or perennially. Seasonal hay fevers are very likely allergin-induced and appear only when particular allergens are present in the air. Children with perennial hay fever experience symptoms throughout the year. Constant contact with animal dander or molds, or psychological distress, may cause these symptoms.

The current prevalence of asthma and hay fever is estimated to be between 3 and 4 percent (NCHS, 1973a). The cumulative prevalence for hay fever was estimated as 4.6 percent for children ages 6 to 11 and 9.2 percent for ages 12 to 17 (NCHS, 1973b). According to results from the National Ambulatory Medical Care Survey of 1977, for persons of all ages, hay fever was the seventh most frequently rendered principal diagnosis for physician office visits, which accounts for 2 percent of all visits (NCHS, 1980).

Depending on the physician's definition of hay fever's minimal symptoms, a child may be labeled as having hay fever and thus may or may not be tested for an allergic cause. If the parent or child does not report, or deemphasizes, the symptoms when visiting the physician (or does not seek care), the disease will likely be underdiagnosed or undiagnosed.

Treatment for hay fever includes both specific and nonspecific modes. Specific modes attempt to avoid, eliminate, or immunize against a particular allergen. Nonspecific modes include the use of antihistamines, decongestants, or combinations of these two drugs. Therapies that are applied directly to the nasal mucosa should be used only temporarily. If used too long or too often, they eventually irritate the mucosa and cause the symptoms they were intended to prevent.

All methods for diagnosing hay fever except the medical history were considered either impractical or too expensive for a general population survey. Thus, the HIE used a self-administered MHQ to obtain information about the presence of hay fever and other plant allergies (Appendix E) (Beck et al., 1983). Broder et al. (1974) showed that questionnaire responses, when compared to physician diagnosis of hay fever, could adequately discriminate between those who had hay fever and those who did not.

VISION IMPAIRMENT

Vision impairment among children may be manifested as diminished acuity or misalignment of the eyes. These conditions may arise because of the shape of the eye, ocular muscle imbalance, suppressed vision in one eye, or congenital problems. The HIE concentrated on detecting problems of visual acuity. Because a child's eye continues to grow until early puberty, there is no universal agreement as to what level of diminished acuity constitutes a true impairment at a given age.

Numerous sources of data provide evidence that vision impairment is one of the more prevalent conditions among children in the United States. Kessner et al. (1974) found that 28 percent of children in a general population had some type of vision problem. Fully a fifth of the children surveyed had poor far-vision acuity with their corrective lenses. The NCHS has conducted three surveys in which vision problems were assessed: 1963–1965 (for children 6 to 11 years old), 1966 to 1967 (for children 12 to 17 years old), and 1971 to 1972 (children of all ages). Reporting levels of acuity for the better eye, the earliest study found that 38 percent of children between the ages of 6 and 11 had natural distance acuity of their better eye worse than 20/20; 20 percent had acuity of 20/30 or worse (NCHS, 1970a). The second survey (1966 to 1967) found that among the older children 43 percent were unable to achieve 20/20 far vision acuity with one or both eyes while using their available corrective lenses during testing (NCHS, 1974). In the most recent NCHS study, of children 6 to 11 years old 27.5 percent had vision worse than 20/20 in their better eye. Among youths 12 to 17 years old, 17 percent were unable to test 20/20 far vision in their better eyes (NCHS, 1977).

Acuity deficits have the capacity to affect a child's learning abilities and his social and psychological development (NSPB, 1982). One major consequence of higher levels of impairment is activity restrictions (Duke-Elder and Abrams, 1970; Sherman, 1972; Post, 1978). Because any deficiency of acuity is likely to affect a child's performance, in or out of school, the general effect of impairment is an increase in stress during childhood. Impaired acuity may also have other physiologic consequences. Specifically, amblyopia may develop when refractive errors are unequal in the two eyes (Stager, 1977). Amblyopia reduces binocular vision to monocular vision by eliminating stereoscopic depth perception.

For a child's vision problems to have a good prognosis it is crucial that the child be treated as soon as the problems are recognized and diagnosed (Post, 1978; Taylor, 1980). The retina and occipital cortex are incomplete at birth, and their development depends on use. If the

eye has trouble receiving a stimulus, vision will be impaired because the actual apparatus for seeing will not develop fully (Gardiner, 1978). Therefore, correction of visual disorders is far more important among children than adults, and treatment may begin as early as one year. It is worthwhile to treat children with relatively small refractive errors whenever symptoms of ocular fatigue such as irritated eyes, headaches, and tiredness are experienced.

Visual deficiences resulting from refractive errors can be corrected through the prescription of glasses or contact lenses. Because the prescription of glasses is a simple and inexpensive procedure and inflicts no risk to the patient, it is the preferred treatment for almost all children who need to improve their visual acuity.

Measurements of visual acuity were obtained for each eye separately (Rubenstein et al., 1984). If a child could read letters, the Snellen Eye Chart was used; otherwise the Picture Eye Chart or the Illiterate E Chart was used, the preference going to the Illiterate E Chart. Vision testing was done with 300- to 500-foot lumens of light, at eye level. The room was lit with additional nonglare lighting to achieve the desired illumination. Medical assistants, trained by a board-certified ophthalmologist, conducted the examinations. If the examinee had glasses or contact lenses, both the corrected and uncorrected near and far vision was tested. For far vision testing, the examinee was asked to read the line equivalent to 20/40 with one eye occluded. If more than one letter was missed, the examinee was asked to read the next line up until only one letter on a line was missed. If the examinee successfully read the 20/40 line, testing proceeded down the chart to smaller print until the line equivalent to 20/15 was reached. In this evaluation of the effects of cost sharing we present data for children's far vision with usual correction in the better eye.

HEARING LOSS

When speech and nonspeech hearing loss rates are combined, nearly 19 percent of children experience some difficulty. Most hearing loss among children is mild and likely to be temporary resulting from middle ear disease. A persistent or moderate hearing loss, however, usually has serious consequences for the child's development (Downs, 1983). Hearing loss has been associated with speech and language learning and other learning dysfunctions. It is uncertain whether minor hearing loss, as is caused by otitis media, negatively affects speech or learning. Yet the number of potentially affected children is large so the issue remains of critical importance.

Kessner et al. (1974) estimated the prevalence of hearing loss among children 4 to 11 years of age. Mean threshold values were calculated for the speech frequencies (500, 1000, and 2000 Hz) and the low (125 and 250 Hz) and high (4000 and 8000 Hz) nonspeech frequencies. He found that among the 1639 children in his study, 6.7 percent experienced loss at the speech levels (2.2 percent bilateral; 4.5 percent unilateral) and 12.2 percent had a loss at the nonspeech levels (4.6 percent bilateral; 7.6 percent unilateral). The prevalence of hearing loss decreased with age. An NCHS (1970b) survey between 1963 and 1965 on the hearing status of a national probability sample of 7119 children ages 6 to 11 years found, using average hearing threshold of the speech frequencies of the better ear, that the overall prevalence of hearing loss was 1.9 percent for boys and 1.5 percent for girls. Comparisons of the age-specific rates of bilateral loss at the speech frequencies (Kessner) with the same rates of hearing loss in the better ear (NCHS) shows them to be very similar for children ages 6 to 11 years.

The mild hearing loss that is common in general populations typically subsides with successful treatment of middle ear disease. Therapy consists of antibiotics or surgical procedures to relieve inflammation.

Measures of hearing acuity were obtained on children 4 to 13 years of age for each ear. The child was seated in a soundproof booth and tested (without usual correction if any was used) with a Beltone 12–0 manual pure tone threshold audiometer using the following procedure.

The child was familiarized with the test before the actual testing began. A tone of gradually increasing intensity was presented until the child acknowledged it. The actual threshold determination started with the first test tone (1000 Hz) presented at an intensity of 20 dB below that of the familiarization tone. At the point that the examinee failed to respond, the intensity was increased in 5 dB increments until the sound was heard again. The intensity was then raised another 5 dB and, after response, decreased by 15 dB. Another series of ascending presentations was begun. For HIE purposes, the threshold was defined as the lowest level at which responses occurred in at least half of the ascents, with a minimum of three responses at a single level. This procedure was repeated to determine the thresholds of the remaining frequencies (500, 2000, and 4000 Hz).

A child is defined as having hearing loss if the average hearing threshold level in the better ear is 16 dB or more. This criterion implies that a child who is counted as being hearing impaired is in fact experiencing bilateral hearing loss because the threshold in the worse ear is higher than 16 dB. This conservative definition permits greater confidence in identification of a true hearing deficit.

FLUID IN THE MIDDLE EAR

Otitis media is among the most prevalent conditions afflicting a general population of children. Otitis media or inflammation of the middle ear usually is accompanied by the accumulation of fluid in the middle ear canal. Because screening techniques permit us only to assess the amount of fluid in the middle ear we will refer to our data in this way to avoid any misunderstanding or misinterpretations given the differing diagnostic criteria and debates about otitis media.

Published reports indicate that overall prevalence of otitis media is between 15 to 20 percent of the pediatric population. In an NCHS survey of otoscopy findings, approximately 15 percent of children ages 6 to 11 had otoscopic abnormalities of the right eardrum (NCHS, 1973a). Several community studies report similar findings. Kessner et al. (1974) using otoscopy performed by board-certified or board-eligible otolaryngologists, found that among Washington, D.C., children 6 months to 11 years, 19.2 percent suffered otitis media. Among the youngest children (6 months to 3 years) the prevalence of ear disease was 27.6 percent and among the oldest children (age 11) only 14.4 percent suffered ear disease. Biles et al. (1980) provide data on Galveston, Texas, children ages 0 to 8 years who received care in 1975. More than a third (35 percent) of the children at risk had one episode of otitis during the year and 12 percent had two or more episodes. The risk of developing acute otitis media is highest in the first two years of life and decreases with age.

This condition can be painful and uncomfortable for the child resulting in limitations of usual activities (school days lost) and can produce considerable concern among parents. Complications from acute middle ear disease are rare. The predominant problem is mild hearing loss, which usually subsides when the inflammation resolves. Chronic otitis, inflammation exceeding 3 months duration, can be associated with complications such as a perforated or scarred eardrum and necrosis or scarring of the middle ear ossicles.

Care for otitis media involves antibiotics and symptomatic medications for acute cases, whereas in nonsuppurative cases, myringotomy (incision of the ear drum) and implantation of tympanostomy tubes are also used. All cases require careful follow up to prevent potential hearing deficits that could cause speech or learning dysfunction.

This disorder is among the most common diagnoses made by physicians for office visits by persons under 22 years of age. NCHS (1981) reported that in 1977–1978 more than 11 million visits were made to office-based physicians by patients under 15 years of age with earache or ear infection as the principal reason for visit. These visits

represented over 5 percent of all visits for children under 15. NCHS (1983) reported that in 1980, 11.7 million visits were for supportative and unspecified otitis media; 77 percent were described as an acute problem, 10 percent as a flare-up of a chronic problem, and 8 percent as a routine chronic problem. Teele et al. (1983) reported that of Boston children followed in a longitudinal study for the first five years of life, the proportion of visits involving otitis ranged from about 23 percent (children under 1 year) to about 42 percent (children age 4). They found no difference in prevalence of disease among children from low and high socioeconomic backgrounds.

Although a clinical assessment using otoscopy rather than tympanometry would have been preferable, it was not possible given the financial constraints of the HIE. Thus, the classification of children with fluid in the middle ear is based solely on tympanometry data. Because of the limitations of these data, a conservative definition was employed in the identification of children with middle ear disease.

Measurements of eardrum compliance were obtained from children ages 4 through 13 for each ear separately with an American Electronics Impedance Audiometer Model 81 (Lohr et al., 1983). A technician recorded the maximum compliance and the air pressure at which maximum compliance occurred. The technician also evaluated the shape of the tympanogram according to four standard "slopes."

PARENTAL WORRY

Parents were asked to describe the level of worry they experienced as a result of their children's health. In particular, for each physiologic condition examined parents were asked to describe the degree of worry or concern experienced. The highest level of worry expressed by the parent across conditions provided us with an assessment of parental concern. The worry scale ranged from 1 (not at all) to 4 (a great deal).

PHYSICAL HEALTH

Our physical health measures examine limitations in the performance of various specific daily activities (Eisen et al., 1980). Assessments of limitations were made by parental responses to a battery of questions about self-care, mobility, and physical activities (Appendix E).

Questionnaire items were adapted from those used for adults (14 years old and older) in the HIE (Stewart et al., 1978). Those measures were based on the work of Patrick, Bush, and Chen (1973) and of

Reynolds, Rushing, and Miles (1974), who examined functional limitations of both children and adults.

In this report we present effects of insurance on one aspect of physical health, namely, role limitations, which pertain to limitations in kind or amount of play, school, or other usual activities.

MENTAL HEALTH PERCEPTIONS

Mental health measures were designed to assess both positive and negative states of psychological well-being. As with the other health perception measures, assessments were based on parental responses (for children less than 14 years old) and self reports (for those 14 years and older) to a battery of self-administered questions. Because we followed a cohort of children 0–13 years of age at enrollment, some children were 18 years old upon exit from the study. Thus, both parental and self-reports were used in these analyses. In the HIE we examine children's mental health status through the use of a mental health rating index, which provides an aggregate assessment of the child's affective mental health (psychological distress and psychological well-being).

Questionnaire items selected for this assessment were based on content analysis of mental health survey measures of general populations and on the battery of items used for adults in the HIE (Ware et al., 1979). The items chosen to measure mental health (Appendix E) evaluated constructs of distresses (e.g., child seemed relaxed, bothered by nervousness, anxious, worried, seemed lonely, depressed) and positive well-being (e.g., seemed cheerful or happy and enjoyed things) during the month before the questionnaire administration (Eisen et al, 1980). Both positively and negatively worded items were used to achieve a wide range of scores and a balanced scale.

GENERAL HEALTH PERCEPTIONS

Finally, self-ratings of general health, which are among the most commonly used measures of health status, were assessed. For example, ratings of health as "excellent," "good," "fair," or "poor" have been used in the National Health Examination Survey and other health surveys. These general health measures do not assess a specific health status attribute, but they have been shown empirically to be related to a wide range of physical and mental health concepts and illness behaviors. The general health rating index was used in the HIE to assess perceptions of the child's health, past, present, and future.

General health questionnaire items originally constructed for adults (Ware and Karmos, 1976) and items used in the National Health Examination Survey (NCHS, 1973b) were adapted for assessing the health of children in the HIE. Items were defined with respect to time (perceptions of prior and current general health) and with respect to resistance or susceptibility to illness (Appendix E). Positively and negatively worded items were used to balance the rating scale.

Appendix C

MEDICAL HISTORY QUESTIONNAIRE ITEMS USED TO ASSESS HEALTH STATUS

GENERAL HEALTH

DO NOT WRITE IN THIS SPACE

5. **IN GENERAL, WOULD YOU SAY THIS CHILD'S HEALTH IS EXCELLENT, GOOD, FAIR, OR POOR?**

(Circle one)

Excellent	1	24/
Good	2	
Fair	3	
Poor	4	

---

6. **DURING THE PAST 3 MONTHS, HOW MUCH HAVE YOU WORRIED ABOUT THIS CHILD'S HEALTH?**

(Circle one)

A great deal	1	25/
Somewhat	2	
A little	3	
Not at all	4	

---

7. **DURING THE PAST 3 MONTHS, HOW MUCH PAIN OR DISTRESS HAS THIS CHILD'S HEALTH CAUSED HIM OR HER?**

(Circle one)

A great deal	1	26/
Some	2	
A little	3	
None at all	4	

---

8. **DOES THIS CHILD'S HEALTH LIMIT HIM OR HER IN ANY WAY IN USING PUBLIC TRANSPORTATION OR A BICYCLE?**

(Circle one)

Yes	1	*—Answer 8-A*	27/
No	2	*—Go to 9, next page*	

8-A. **HOW LONG HAS THIS CHILD'S HEALTH LIMITED HIM OR HER IN USING PUBLIC TRANSPORTATION OR A BICYCLE?**

(Circle one)

Less than 1 month	1	28/
1 - 3 months	2	
More than 3 months	3	

CARD 02

DO NOT WRITE IN THIS SPACE

9. DOES THIS CHILD NEED HELP IN GETTING AROUND THE NEIGHBORHOOD BECAUSE OF HEALTH?

Yes ..... 1 —*Answer 9-A* 29/
No ..... 2 —*Go to 10*

9-A. HOW LONG HAS THE CHILD NEEDED HELP IN GETTING AROUND THE NEIGHBORHOOD BECAUSE OF HEALTH?

(Circle one)

Less than 1 month 1 30/
1 - 3 months 2
More than 3 months 3

---

10. DOES THIS CHILD HAVE TO STAY INDOORS MOST OR ALL OF THE DAY BECAUSE OF HEALTH?

Yes ..... 1 —*Answer 10-A* 31/
No ..... 2 —*Go to 11*

10-A. HOW LONG HAS THE CHILD HAD TO STAY INDOORS BECAUSE OF HEALTH?

(Circle one)

Less than 1 month 1 32/
1 - 3 months 2
More than 3 months 3

---

11. IS THIS CHILD IN BED OR A CHAIR FOR MOST OR ALL OF THE DAY BECAUSE OF HEALTH?

Yes ..... 1 —*Answer 11-A* 33/
No ..... 2 —*Go to 12, next page*

11-A. HOW LONG HAS THE CHILD BEEN IN BED OR A CHAIR FOR MOST OR ALL OF THE DAY BECAUSE OF HEALTH?

(Circle one)

Less than 1 month 1 34/
1 - 3 months 2
More than 3 months 3

CARD 02

DO NOT WRITE IN THIS SPACE

12. DOES THIS CHILD'S HEALTH LIMIT THE KIND OR AMOUNT OF VIGOROUS ACTIVITIES HE OR SHE CAN DO, SUCH AS RUNNING, LIFTING HEAVY OBJECTS OR TAKING PART IN STRENUOUS SPORTS?

Yes, health limits these activities ..... 1 —*Answer 12-A* 35/
No ..... 2 —*Go to 13*

12-A. HOW LONG HAS THE CHILD'S HEALTH LIMITED THE VIGOROUS ACTIVITIES HE OR SHE CAN DO?

(Circle one)

Less than 1 month 1 36/
1 - 3 months 2
More than 3 months 3

---

13. DOES THIS CHILD HAVE TROUBLE EITHER WALKING SEVERAL BLOCKS OR CLIMBING A FEW FLIGHTS OF STAIRS BECAUSE OF HEALTH?

Yes ..... 1 —*Answer 13-A* 37/
No ..... 2 —*Go to 14*

13-A. HOW LONG HAS THE CHILD HAD TROUBLE WALKING SEVERAL BLOCKS OR CLIMBING A FEW FLIGHTS OF STAIRS BECAUSE OF HEALTH?

(Circle one)

Less than 1 month 1 38/
1 - 3 months 2
More than 3 months 3

---

14. DOES THIS CHILD HAVE TROUBLE BENDING, LIFTING, OR STOOPING BECAUSE OF HEALTH?

Yes ..... 1 —*Answer 14-A* 39/
No ..... 2 —*Go to 15, next page*

14-A. HOW LONG HAS THE CHILD HAD TROUBLE BENDING, LIFTING, OR STOOPING?

(Circle one)

Less than 1 month 1 40/
1 - 3 months 2
More than 3 months 3

CARD 02

DO NOT WRITE IN THIS SPACE

15. BECAUSE OF HEALTH, DOES THIS CHILD HAVE TROUBLE EITHER WALKING ONE BLOCK OR CLIMBING ONE FLIGHT OF STAIRS?

Yes ..... 1 —*Answer 15-A* 41/
No ..... 2 —*Go to 16*

15-A. HOW LONG HAS THE CHILD HAD TROUBLE EITHER WALKING ONE BLOCK OR CLIMBING ONE FLIGHT OF STAIRS?

(Circle one)

Less than 1 month 1 42/
1 - 3 months 2
More than 3 months 3

---

16. IS THIS CHILD UNABLE TO WALK, UNLESS ASSISTED BY AN ADULT OR BY A CANE, CRUTCHES, ARTIFICIAL LIMB, OR BRACES?

Yes, unable to walk ..... 1 —*Answer 16-A* 43/
No, no trouble walking ..... 2 —*Go to 17*

16-A. HOW LONG HAS THE CHILD BEEN UNABLE TO WALK WITHOUT ASSISTANCE?

(Circle one)

Less than 1 month 1 44/
1 - 3 months 2
More than 3 months 3

---

17. DOES HEALTH LIMIT THIS CHILD IN ANY WAY (FROM DOING ANYTHING HE OR SHE WANTS TO DO)?

Yes ..... 1 —*Answer 17-A* 45/
No ..... 2 —*Go to 18, next page*

17-A. HOW LONG HAS THE CHILD'S HEALTH LIMITED HIM OR HER IN DOING THINGS HE OR SHE WANTS TO DO?

(Circle one)

Less than 1 month 1 46/
1 - 3 months 2
More than 3 months 3

CARD 02

DO NOT WRITE IN THIS SPACE

18. IS THIS CHILD UNABLE TO DO CERTAIN KINDS OR AMOUNTS OF SCHOOLWORK BECAUSE OF HEALTH? (Consider kindergarten or nursery school as school.)

Yes ..... 1 —*Answer 18-A* 47/
No ..... 2 —*Go to 19*

18-A. HOW LONG HAS THE CHILD BEEN UNABLE TO DO CERTAIN KINDS OR AMOUNTS OF SCHOOLWORK BECAUSE OF HEALTH?

(Circle one)

Less than 1 month 1 48/
1 - 3 months 2
More than 3 months 3

---

19. DOES THIS CHILD'S HEALTH KEEP HIM OR HER FROM GOING TO SCHOOL? (Consider kindergarten or nursery school as school.)

Yes ..... 1 —*Answer 19-A* 49/
No ..... 2 —*Go to 20*

19-A. HOW LONG HAS THE CHILD'S HEALTH KEPT HIM OR HER FROM GOING TO SCHOOL?

(Circle one)

Less than 1 month 1 50/
1 - 3 months 2
More than 3 months 3

---

20. BECAUSE OF HEALTH, DOES THIS CHILD NEED HELP WITH EATING, DRESSING, BATHING, OR USING THE TOILET?

Yes ..... 1 —*Answer 20-A* 51/
No ..... 2 —*Go to 21 next page*

20-A. HOW LONG HAS THE CHILD NEEDED HELP WITH EATING, DRESSING, BATHING, OR USING THE TOILET?

(Circle one)

Less than 1 month 1 52/
1 - 3 months 2
More than 3 months 3

CARD 02

HAY FEVER AND OTHER PLANT ALLERGIES

DO NOT WRITE IN THIS SPACE

42. HAS THIS CHILD EVER HAD HAY FEVER OR OTHER ALLERGIES TO PLANTS AND GRASSES?

Yes ..... 1 — *Answer 43* 26/
No ..... 2 — *Go to 50, page 17*

---

43. WHEN WAS THE LAST TIME THIS CHILD SAW A DOCTOR ABOUT HAY FEVER OR OTHER PLANT ALLERGIES?

(Circle one)

Within the past 3 months 1 27/
3 - 6 months ago 2
7 - 12 months ago 3
More than 1 year ago 4
Never saw a doctor about this 5

---

44. IN THE PAST 12 MONTHS, DID THE CHILD GET ANY SHOTS TO HELP PREVENT HAY FEVER OR OTHER PLANT ALLERGIES?

Yes 1 28/
No 2

---

45. IN THE PAST 12 MONTHS, HAS A DOCTOR PRESCRIBED ANY MEDICINE TO HELP PREVENT THE SYMPTOMS OF HAY FEVER OR OTHER PLANT ALLERGIES?

Yes 1 29/
No 2

---

46. DOES THE CHILD ACTUALLY TAKE ANY MEDICINE FOR THE HAY FEVER OR OTHER PLANT ALLERGIES?

(Circle one)

Yes, prescribed by doctor 1 30/
Yes, but not prescribed 2
No, doesn't take any 3

CARD 03

DO NOT WRITE IN THIS SPACE

47. **DURING THE PAST 12 MONTHS, HOW MUCH PAIN OR DISTRESS HAS THE HAY FEVER OR OTHER PLANT ALLERGIES CAUSED THIS CHILD?**

(Circle one)

A great deal	1	31/
Some	2	
A little	3	
None at all	4	

48. **DURING THE PAST 12 MONTHS, HOW MUCH HAS THIS CHILD'S HAY FEVER OR OTHER PLANT ALLERGIES WORRIED OR CONCERNED YOU?**

(Circle one)

A great deal	1	32/
Somewhat	2	
A little	3	
Not at all	4	

49. **DURING THE PAST 12 MONTHS, IN HOW MANY WEEKS OR MONTHS WAS THE CHILD BOTHERED BY HAY FEVER OR OTHER PLANT ALLERGIES?**

(Circle one)

Not bothered at all in last 12 months	1	—*Go to 50, next page* 33/
Less than 2 weeks of the time	2	—*Answer 49-A-B*
2 weeks but less than 1 month	3	
1 month but less than 2 months	4	
2 months but less than 4 months	5	
4 months but less than 6 months	6	
6 months or more	7	

49-A. **DURING THE WEEKS WHEN THE CHILD WAS BOTHERED BY HAY FEVER OR OTHER PLANT ALLERGIES, HOW MUCH OF THE TIME DID IT KEEP HIM OR HER FROM DOING THE KINDS OF THINGS THAT OTHER CHILDREN THAT AGE DO?**

(Circle one)

All of the time	1	34/
Most of the time	2	
Some of the time	3	
A little of the time	4	
None of the time	5	

49-B. **DURING THE PAST 12 MONTHS, HOW MANY DAYS HAS HAY FEVER OR OTHER PLANT ALLERGIES KEPT THE CHILD IN BED FOR ALL OR MOST OF THE DAY? (Write in number. If none, write "0")**

_____ days in bed in past 12 months 35-36/

CARD 08

DO NOT WRITE IN THIS SPACE

GENERAL WELL-BEING

THESE NEXT QUESTIONS ARE ABOUT HOW THE CHILD HAS BEEN FEELING, DURING THIS PAST MONTH.

FOR EACH QUESTION, PLEASE CIRCLE A NUMBER FOR THE ONE ANSWER THAT COMES CLOSEST TO THE WAY THE CHILD HAS BEEN FEELING.

42. HOW MUCH OF THE TIME DID THIS CHILD SEEM TO FEEL LONELY DURING THE PAST MONTH?

(Circle one)

All of the time	1	36/
Most of the time	2	
A good bit of the time	3	
Some of the time	4	
A little of the time	5	
None of the time	6	

---

43. HOW MUCH OF THE TIME, DURING THE PAST MONTH, DID THIS CHILD SEEM TO FEEL RELAXED AND FREE OF TENSION?

(Circle one)

All of the time	1	37/
Most of the time	2	
A good bit of the time	3	
Some of the time	4	
A little of the time	5	
None of the time	6	

---

44. DURING THE PAST MONTH, HOW MUCH OF THE TIME DID THIS CHILD GENERALLY SEEM TO ENJOY THE THINGS THAT HE OR SHE DID?

(Circle one)

All of the time	1	38/
Most of the time	2	
A good bit of the time	3	
Some of the time	4	
A little of the time	5	
None of the time	6	

CARD 03

DO NOT WRITE IN THIS SPACE

45. HOW MUCH OF THE TIME, DURING THE PAST MONTH, DID THIS CHILD SEEM TO BE DEPRESSED (DOWNHEARTED OR BLUE)?

(Circle one)

- All of the time 1
- Most of the time 2
- A good bit of the time 3
- Some of the time 4
- A little of the time 5
- None of the time 6

39/

---

46. HOW MUCH OF THE TIME, DURING THE PAST MONTH, DID THIS CHILD SEEM TO BE ABLE TO RELAX WITHOUT DIFFICULTY?

(Circle one)

- All of the time 1
- Most of the time 2
- A good bit of the time 3
- Some of the time 4
- A little of the time 5
- None of the time 6

40/

---

47. HOW MUCH DID THIS CHILD SEEM TO BE BOTHERED BY NERVOUSNESS OR "NERVES", DURING THE PAST MONTH?

(Circle one)

- Extremely—to the point where he or she could not go to school or do usual activities 1
- Very much bothered 2
- Bothered quite a bit by nerves 3
- Bothered some, enough to notice 4
- Bothered just a little by nerves 5
- Not bothered at all by nerves 6

41/

---

48. DURING THE PAST MONTH, HOW MUCH OF THE TIME DID THIS CHILD SEEM TO BE RESTLESS, FIDGETY, OR IMPATIENT?

(Circle one)

- All of the time 1
- Most of the time 2
- A good bit of the time 3
- Some of the time 4
- A little of the time 5
- None of the time 6

42/

CARD 08

DO NOT WRITE IN THIS SPACE

49. DURING THE PAST MONTH, HOW MUCH OF THE TIME DID THIS CHILD SEEM TO BE MOODY OR TO BROOD ABOUT THINGS?

(Circle one)

All of the time	1	43/
Most of the time	2	
A good bit of the time	3	
Some of the time	4	
A little of the time	5	
None of the time	6	

50. HOW MUCH OF THE TIME, DURING THE PAST MONTH, DID THIS CHILD SEEM TO BE CHEERFUL AND LIGHTHEARTED?

(Circle one)

All of the time	1	44/
Most of the time	2	
A good bit of the time	3	
Some of the time	4	
A little of the time	5	
None of the time	6	

51. DURING THE PAST MONTH, DID THIS CHILD SEEM TO BE ANXIOUS OR WORRIED?

(Circle one)

Yes, extremely so, to the point of being sick or almost sick	1	45/
Yes, very much so	2	
Yes, quite a bit	3	
Yes, some	4	
Yes, a little bit	5	
No, not at all	6	

52. DURING THE PAST MONTH, HOW MUCH OF THE TIME DID THIS CHILD SEEM TO BE A HAPPY PERSON?

(Circle one)

All of the time	1	46/
Most of the time	2	
A good bit of the time	3	
Some of the time	4	
A little of the time	5	
None of the time	6	

CARD 03

53. **HOW OFTEN DURING THE PAST MONTH DID THIS CHILD SEEM TO WAKE UP FEELING FRESH AND RESTED?**

(Circle one)

All of the time	1
Most of the time	2
A good bit of the time	3
Some of the time	4
A little of the time	5
None of the time	6

DO NOT WRITE IN THIS SPACE

47/

SYMPTOMS LIST

54. DURING THE PAST 30 DAYS, DID THIS CHILD HAVE ANY OF THE FOLLOWING SYMPTOMS? IF HE OR SHE DID HAVE THE SYMPTOM, DID YOU OR THE CHILD SEE A DOCTOR ABOUT IT?

PLEASE CIRCLE ONE NUMBER ON EACH LINE:
1 — Child did not have the symptom at all in the past 30 days
2 — Child had the symptom, but doctor was not seen
3 — Child had the symptom and a doctor was seen about it

	No, did not have this	Had it, but did not see doctor	Had it, and saw doctor	
A. Chicken pox	1	2	3	48/
B. Stomach ache, without vomiting, for less than 24 hours	1	2	3	49/
C. A stomach "flu" or virus, with vomiting or diarrhea lasting at least 2 days	1	2	3	50/
D. An earache, or earache with fever	1	2	3	51/
E. An infection on the skin, without fever	1	2	3	52/
F. Sore throat with high fever, or tonsillitis	1	2	3	53/
G. Cough with a fever for at least 3 days	1	2	3	54/
H. Allergies (such as to grass or certain foods) without asthma	1	2	3	55/
I. Diarrhea (loose bowel movements) lasting for at least 3 days	1	2	3	56/
J. Poor eating habits	1	2	3	57/
K. Problems doing schoolwork or participating in school activities	1	2	3	58/
L. A convulsion or fit (seizure)	1	2	3	59/
M. Nosebleed	1	2	3	60/
N. A cold or runny nose without fever	1	2	3	61/
O. Head injury, with loss of consciousness or vomiting	1	2	3	62/
P. Burning or pain with urination	1	2	3	63/

CARD 03

HEALTH PERCEPTIONS

DO NOT WRITE IN THIS SPACE

55. PLEASE READ EACH OF THE FOLLOWING STATEMENTS, AND THEN CIRCLE ONE OF THE NUMBERS ON EACH LINE TO INDICATE WHETHER THE STATEMENT IS TRUE OR FALSE FOR THIS CHILD. THERE ARE NO RIGHT OR WRONG ANSWERS.

If a statement is definitely true for the child, circle code 5
If it is mostly true for the child, circle code 4
If you don't know whether it is true or false, circle code 3
If it is mostly false for the child, circle code 2
If it is definitely false for the child, circle code 1

SOME OF THE STATEMENTS MAY LOOK OR SEEM LIKE OTHERS. BUT EACH STATEMENT IS DIFFERENT, AND SHOULD BE RATED BY ITSELF.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false	
A. This child's health is excellent	5	4	3	2	1	64/
B. This child was so sick once I thought he or she might die	5	4	3	2	1	65/
C. This child seems to resist illness very well	5	4	3	2	1	66/
D. This child seems to be less healthy than other children I know	5	4	3	2	1	67/
E. This child has never been seriously ill	5	4	3	2	1	68/
F. When there is something going around, this child usually catches it	5	4	3	2	1	69/

CARD 03

Appendix D

ESTIMATED REGRESSION EQUATIONS

INTRODUCTION

This appendix presents detailed information about the regression equations used to evaluate the effects of cost sharing for various measures of child health. First we define all the explanatory variables and interactions. Then we provide the estimated equations and other information about the equations.

VARIABLES USED IN REGRESSION EQUATIONS

Table D.1 defines the names of the variables used in the regression analyses. Unless otherwise noted, dummy variables are scored 1 if "yes" and 0 otherwise.

RESULTS OF REGRESSION ANALYSES

We used standard linear regression models for estimating effects on general health ratings, mental health ratings, functional far vision and parental worry. With the exception of vision, a higher score means better health. For the other health status measures (role limitations, anemia, hay fever, hearing loss, and fluid in the middle ear), we used maximum likelihood logit regression models. A high value on these measures indicated the presence of the condition and thus worse health. The general health ratings index and mental health rating index were transformed from a standardized 0 to 100 point scale to a 0 to 10 point scale to correct for heteroskedasticity. The 0 to 100 point scale was transformed as follows:

$$X' = 10 - \sqrt{100 - X} \qquad X = 0\text{–}100 \textit{ scale}$$

$$X' = 0\text{–}10 \textit{ scale}$$

In the remainder of this appendix detailed results of the regression analyses are presented.

Table D.1

GLOSSARY OF ACRONYMS

Variable Name	Variable Definition
	Demographic
MALE	Dummy variable indicating whether the child was male (scored 1 if male, 0 if female).
TINC	Family income as measured at baseline (three to nine months before enrollment). This value was computed by (1) standardizing the family's reported income for the two years before baseline to 1974 dollars using cost-of-living adjustments, (2) correcting for intersite differences in cost of living, (3) adding $1000, (4) dividing by a family size adjustment factor, and (5) taking the natural logarithm of this value. In all interactions, income is measure in its log form centered at its mean.
DAYTON	Dummy variable for Dayton, Ohio participants.
FITCH	Dummy variable for Fitchburg, Massachusetts participants.
FRANK	Dummy variable for Franklin County, Massachusetts, site.
CHARLES	Dummy variable for Charleston, South Carolina, site.
GEORGE	Dummy variable for Georgetown, South Carolina, site.
LFAMSIZE	Family size taken to the natural logarithm.
NONWHITE	Dummy variable indicating race of child (1 if nonwhite, 0 if white).
AGE	Age of the child at enrollment.
LESSHS	Dummy variable for parental education level less than high school.
SOMECOL	Dummy variable for parental education (1 if some college; 0 otherwise).
COLLG	Dummy variable for parental education (1 if college graduate or more; 0 otherwise).
EDUC	Parental education—years of schooling.
	Experimental
TERM3	Dummy variable indicating whether child participated for three years (1 if three years; 0 if five).
COINS	Dummy variable indicating child participated in cost-sharing plan.
INCXCOIN	Interaction between centered TINC and COSTSHARING plans.
DAYENRV	Dummy variable indicating enrollment variable not fielded at Dayton enrollments substituted by predicted value.
TOOKPHYS	A dummy variable indicating whether child took medical screening examination at enrollment.
HRTYPE	A dummy variable indicating whether health diary was kept during participation.
95ID	Dummy variable indicating whether child was assigned to the individual deductible plan.
95P	Dummy variable indicating whether the child was assigned one of the three income-related catastrophic plans.
5025P	Dummy variable indicating whether the child was assigned to one of the nine intermediate coinsurance plans.

Table D.1 (Cont.)

Variable Name	Variable Definition
	Health Status Measures
ROLEDUM4	Dummy variable indicates enrollment response on infant (0–4) form of medical history.
ROLEDUM6	Dummy variable indicates enrollment response on adult (14+) form of medical history.
ROLE0	Enrollment role limitations (1 if limited; 0 otherwise).
ROLEX	Exit role limitations (1 if limited; 0 otherwise).
DUM1X4	Dummy variable indicates pediatric (5–13) form responses at enrollment and exit.
SQRMHI0	Enrollment Mental Health Rating Index; 0–10 scale, higher score indicates better mental health.
SQRMHIX	Exit Mental Health Rating Index; 0–10 scale; higher score indicates better mental health.
DUM1X4	Dummy variable indicates infant form response at enrollment and exit.
DUM1X5	Dummy variable indicates infant form response at enrollment and pediatric at exit.
DUM2X5	Dummy variable indicates pediatric form response at enrollment and exit.
SQRGHI0	Enrollment General Health Rating Index; 0–10 scale, higher score indicates better health.
SQRGHIX	Exit General Health Rating Index; 0–10 scale, higher score indicates better health.
BINSTAT	Dummy variable of hemoglobin status at enrollment (1 if low hemoglobin; 0 otherwise).
BINSTATX	Dummy variable of hemoglobin status at exit (1 if low hemoglobin; 0 otherwise).
HAYCURT	Dummy variable of bothered by hay fever and other plant allergies at enrollment (1 if bothered; 0 otherwise).
HAYCURTX	Dummy variable of bothered by hay fever and other plant allergies at exit (1 if bothered; 0 otherwise).
BINIHEAR	Dummy variable of hearing impairment at enrollment (1 if impaired; 0 otherwise).
BINIHERX	Dummy variable of hearing impairment at exit (1 if impaired; 0 otherwise).
BIN30TMD	Dummy variable of fluid in middle ear at enrollment (1 if fluid; 0 otherwise).
BIN30TMX	Dummy variable of fluid in middle ear at exit (1 if fluid; 0 otherwise).
BLINFUNF	Far vision in Snellen lines at enrollment.
BLINFUNFX	Far vision in Snellen lines at exit.
MOMWOR0	Parental worry about specific health conditions at enrollment; scale 1–4, higher score indicates more worry.
MOMWORX	Parental worry about specific health conditions at exit; scale 1–4, higher score indicates more worry

The standard errors and the t-tests were computed using Huber's (1967) formula for the variance of a robust regression. To apply Huber's formula, the family was considered the unit of observation and linear regression on individuals as an M-estimator. (An M-estimator is a type of robust estimator.) Linear regression is not the maximum likelihood estimator because individuals within a family have correlated responses. By calculating $R_2R_1R_2$, which is an asymptotically consistent estimate of the covariance matrix of the regression parameters, we correct for the intrafamily correlation regardless of its form or heteroskedasticity.

R_1 and R_2 are defined as follows:

$$R_1 = \sum_{\substack{\text{across} \\ \text{families}}} \left(\sum_{\substack{\text{within} \\ \text{family}}} X_i r_i\right)' \left(\sum_{\substack{\text{within} \\ \text{family}}} X_i r_i\right)$$

$$R_2 = (X'X)^{-1}\sigma^2.$$

X_i stands for the matrix of observed data and r_i for the vector of residuals for family member i.

Table D.2

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: ROLE LIMITATIONS

Variable	Logit Coeff.	t-Test
INTERCEPT	−4.212	−0.969
ROLEDUM4	−0.499	−0.561
ROLEDUM6	0.514	1.334
MALE	−0.823	−2.236
TERM3	0.649	1.568
TINC	0.041	0.087
COINS	0.081	0.215
INCXCOIN	−0.471	−0.811
ROLE0	2.458	4.939

N = 1544.

Loglikelihood ratio = 20.339.

Table D.3

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: MENTAL HEALTH

Variable	Coeff.	t-Test
INTERCEPT	1.438	1.121
SQRMHI0	0.403	11.053
REDDUM	−0.555	−3.379
DAYENRV	0.133	0.481
DAYTON	−1.076	−0.632
FITCH	0.042	0.237
FRANK	0.021	0.125
CHARLES	0.570	2.550
GEORGE	0.025	0.116
LFAMSIZE	−0.035	−0.219
NONWHITE	−0.154	−1.007
AGE	−0.027	−1.027
LESSHS	−0.023	−0.199
SOMECOL	−0.148	−0.997
COLLG	0.075	0.461
TERM3	0.094	0.809
TOOKPHYS	0.153	1.480
TINC	0.232	1.747
MALE	0.065	0.688
HRTYPE	−0.009	−0.063
INCXCOIN	−0.245	−1.513
COINS	0.112	1.101

N = 1097.

Estimated standard deviation = 1.3374.

R-squared = 0.2130.

NOTE: t-tests deflated by 1.628 to correct for intrafamily correlation.

Table D.4

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: GENERAL HEALTH

Variable	Coeff.	t-Test
INTERCEPT	4.858	3.587
SQRGHI 0	0.377	13.364
INFDUM	−0.440	−1.872
INFPEDDUM	−0.081	−0.427
PEDADLTDUM	−0.805	−4.425
DAYENRV	−0.002	−0.015
DAYTON	−0.565	−0.722
FITCH	−0.147	−0.776
FRANK	−0.212	−1.172
CHARLES	−0.047	−0.198
GEORGE	−0.275	−1.215
LFAMSIZE	−0.176	−1.059
NONWHITE	−0.246	−1.506
AGE	−0.020	−0.840
LESSHS	−0.175	−1.372
SOMECOL	−0.131	−0.870
COLLG	0.275	1.615
TERM3	0.009	0.074
TOOKPHYS	−0.180	−1.654
TINC	−0.040	−0.278
MALE	−0.077	−0.765
HRTYPE	−0.091	−0.562
INCXCOIN	0.117	0.664
COINS	0.034	0.312

N = 1586.

Estimated standard deviation = 1.659.

R-squared = 0.2053.

NOTE: t-tests deflated by 1.201 to correct for intrafamily correlation.

Table D.5

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: ANEMIA

Variable	Logit Coeff.	t-Test
INTERCEPT	−6.595	−1.007
BINSTAT	1.971	3.985
TINC	0.267	0.378
COINS	0.119	0.260
INCXCOINS	−1.184	−1.535

N = 1545.

Loglikelihood ratio = 14.463.

NOTE: t-tests deflated by 1.201 to correct for intrafamily correlation.

Table D.6

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: HAY FEVER

Variable	Logit Coeff.	t-Test
INTERCEPT	−4.918	−1.803
DAYTON	0.376	1.103
FITCH	0.334	0.854
FRANK	−0.318	−0.841
CHARLES	−0.294	−0.650
GEORGE	−0.449	−1.102
EDUC	0.047	0.923
AGE	0.182	4.068
TINC	0.148	0.495
COINS	−0.428	−1.761
INCXCOIN	0.315	0.759
HAYFCURT	2.656	6.431

N = 1168.

Loglikelihood ratio = 100.062.

NOTE: t-tests deflated by 1.201 to correct for intrafamily correlation.

Table D.7

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: HEARING LOSS

Variable	Logit Coeff.	t-Test
INTERCEPT	−1.471	−5.318
BINIHEAR	1.867	4.290
NONWHITE	0.139	0.538
AGE	−0.121	−3.973
INC	0.145	0.503
COINS	−0.159	−0.706
INCXCOIN	−0.645	−1.814

N = 1470.

Loglikelihood ratio = 29.118.

NOTE: t-tests deflated by 1.20 to correct for intrafamily correlation.

Table D.8

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: FLUID IN MIDDLE EAR

Variable	Logit Coeff.	t-Test
INTERCEPT	−1.755	−1.296
BINE30TMD	1.876	7.216
NONWHITE	−0.459	−2.081
AGE	−0.059	−2.165
TINC	0.054	0.376
MALE	−0.040	−0.266
TERM3	0.630	3.319
COINS	0.009	0.053
DAYTON	−0.124	−0.494
FITCH	0.024	0.092
FRANK	−0.368	−1.546
CHARLES	−0.432	−1.278
GEORGE	−0.230	−0.901

N = 987.

Loglikelihood ratio = 43.644.

Table D.9

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: FAR VISION WITH USUAL CORRECTION

Variable	Coeff.	t-Test
INTERCEPT	2.808	2.901
BLINFUNF	0.275	7.476
AGE	−0.061	−5.250
MALE	−0.086	−1.125
NONWHITE	−0.165	−1.720
TINC	−0.048	−0.459
COINS	0.066	0.813
INCXCOIN	0.022	0.167

N = 1591.

Estimated standard deviation = 1.2717.

R-squared = 0.1324.

NOTE: t-test deflated by 1.201 to correct for intrafamily correlation.

Table D.10

ESTIMATED REGRESSION MODEL AND CORRECTED t-TEST VALUES: PARENTAL WORRY

Variable	Coeff.	t-Test
INTERCEPT	1.759	4.618
MOMWOR0	0.218	5.401
AGE	−0.017	−2.827
MALE	0.002	0.053
NONWHITE	−0.087	−1.361
GINDXX	−0.008	−5.906
TERM3	0.059	1.326
TINC	0.011	0.275
DAYTON	0.104	1.501
FITCH	0.060	0.797
FRANK	−0.034	−0.492
CHARLES	−0.060	−0.739
GEORGE	0.011	0.150
COINS	−0.050	−1.158

N = 1535.

R-squared = 0.0858.

NOTE: t-tests deflated by 1.201 to correct for intrafamily correlation.

Appendix E

RESULTS OF ANALYSES OF EFFECT OF SITE

INTRODUCTION

To understand the results for the average child, we analyzed health outcomes in each of the experimental sites. Sites were chosen to represent the four major census regions of the country and to reflect variation in the amount of stress on the ambulatory medical care system as judged by times for new and return appointments, number of facilities, and medical resources. Thus, our main results could have resulted from offsetting effects in the different sites. These analyses examine this possibility.

METHODS

For each site raw means and proportions of health status variables are evaluated before the experimental intervention and upon exit from the experiment. Differences between children on the free plan and on the cost-sharing plans are contrasted by computing predicted exit values for the four regions using site-specific means for the explanatory variables.

RESULTS

Table E.1 presents values of demographic, study, and health status measures at enrollment in each site. In general, children in each of the experimental plans are similar in all sites. In Massachusetts, children on the free care plan have lower incomes than children on the cost-sharing plans. In each site we also see differences in the percentages of children participating in the various experimental interventions. Tables E.2 through E.8 provide detailed demographic and experimental information about each locality by insurance plan type.

Table E.9 presents predicted health values for participants in each site. A few differences were observed in free plan and cost-sharing plan contrasts. Two differences were observed in Dayton, and one each in Seattle and Massachusetts. No differences were observed in South Carolina.

Table E.1

VALUES OF DEMOGRAPHIC AND STUDY MEASURES OF CHILDREN AGED 0-13 AT ENROLLMENT, BY INSURANCE PLAN AND SITE

Variable or Measure	Dayton		Seattle		Massachusetts		South Carolina	
	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans
Demographics								
Number of enrollees	89	254	127	219	180	347	203	425
Age (yr)	7.34	7.01	6.75	6.89	7.12	7.50	7.12	7.22
Male (%)	48.3	52.0	49.6	53.0	57.2	50.4	51.2	51.5
Nonwhite (%)	13.5	10.6	3.97	7.34	2.25	2.61	54.2	60.4
Family income (time)	9.47	9.45	9.16	9.27	9.02	9.17*	8.95	8.90
Mother's education (yr)	11.83	12.43	12.38	12.68	12.16	12.27	10.95	10.83
Prior Use of Medical Care								
Hospitalizations (%)	2.30	6.37	7.56	6.64	9.60	7.42	8.00	7.40
Physician visits	3.89	3.63	2.83	2.76	3.69	3.02	3.06	3.07
Experimental Treatments								
Screening exam	58.4	48.0	51.2	63.5*	80.0	76.4	60.6	51.1*
TERM3 (%)	37.1	51.2*	81.9	74.4	67.8	75.2	74.9	73.6

*Contrast free vs. cost sharing, $p < 0.05$.

In Dayton, no differences were observed among the health perceptions measures but differences in the level of hearing loss and hay fever were observed among the physiologic measures. In both cases, children on the free care plan experience negative health effects of increased access to medical care. Similarly in Massachusetts they appear to experience negative effects as reflected in lower mental health ratings. In Seattle, however, children experience positive effects reflected in better functional vision for children on the free care plan.

CONCLUSION

We did not see our best measure of health status, the general health rating index, differ significantly in any site. The pattern of differences by plan across the sites is mixed, except in Dayton. Dayton children

Table E.2

ENROLLMENT AND EXIT HEALTH STATUS VALUES OF CHILDREN AGED 0-13, BY INSURANCE PLAN AND SITE

Variable or Measure	Dayton		Seattle		Massachusetts		South Carolina	
	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans
Demographics								
Number of enrollees	89	254	127	219	180	347	203	425
Enrollment Health Variables								
ROLELIMO (%)	3.41	2.39	4.03	4.63	4.49	2.36	1.08	4.43
SQRMHIO[a]	6.11	6.13	5.88	5.94	6.23	6.16	6.44	6.16
SQRGHIO[a]	5.98	6.00	5.89	6.14	6.09	6.15	5.81	5.55
ANEMIA (%)	32.7	31.5	6.67	5.26	0.01	1.67	8.04	10.5
HAY FEVER (%)	–	–	15.2	9.29	10.0	8.16	5.21	6.22
VISION[b]	2.70	2.40	3.30	3.27	2.61	2.69	2.91	2.77
HEARING LOSS (%)	5.88	1.28	5.00	6.93	10.2	7.69	9.33	4.20
FLUID IN MIDDLE EAR (%)	16.67	18.8	27.0	22.5	33.6	28.6	22.6	25.2
Exit Health Values								
ROLELIM (%)	3.41	3.49	3.42	3.65	4.35	2.80	1.35	4.20
SQRMHI[a]	5.75	5.85	5.81	5.89	5.69	6.03[c]	6.14	6.10
SQRGHI[a]	5.31	5.63	5.76	5.99	5.66	5.72	5.51	5.35
ANEMIA (%)	1.25	1.91	0.01	3.31	2.01	1.05	3.33	4.27
HAY FEVER (%)	35.6	20.2[c]	19.3	20.3	19.3	16.1	12.5	8.19
VISION[b]	2.68	2.61	2.38	2.86[c]	3.03	2.89	2.54	2.56
HEARING LOSS (%)	15.4	5.73[c]	11.0	9.64	9.03	10.0	11.6	11.4
FLUID IN MIDDLE EAR (%)	30.6	27.2	41.0	36.2	32.5	34.6	27.5	28.8

[a]0–10 scale; a higher value denotes better health.
[b]In Snellen lines values 2 = 20/20, 3 = 20/25, 4 = 20/30.
[c]Contrast free vs. cost sharing, $p < 0.05$.

Table E.3

VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES OF DAYTON CHILDREN AGED 0-13 AT ENROLLMENT, BY INSURANCE PLAN

Variable or Measure	No.	95%/ID Plan	No.	95% Plan	No.	50/25% Plan	No.	Cost-Sharing Plans	No.	Free Plan
				Demographics						
AGE	25	5.96	80	7.51	149	6.91	254	7.01	89	7.34
		(3.92)		(3.66)		(3.72)		(3.73)		(4.09)
MALE (%)	25	52.0	80	51.3	149	52.3	254	52.0	89	48.3
NONWHITE (%)	25	8.0	80	8.8	149	12.1	254	10.6	89	13.5
TINC	25	9.43	80	9.42	149	9.46	254	9.45	89	9.47
		(0.67)		(0.55)		(0.56)		(0.56)		(0.45)
EDUC	25	13.00	80	12.29	149	12.41	254	12.43	89	11.83
		(2.74)		(2.23)		(2.58)		(2.49)		(1.79)
HOSP (%)	24	4.17	80	8.75	147	5.44	251	6.37	87	2.29
MDVIS	24	2.92	78	3.77	147	3.68	249	3.63	87	3.89
		(2.90)		(4.47)		(3.63)		(3.85)		(5.91)
TOOKPHYS (%)	25	56.0	80	50.0	149	45.6	254	48.0	89	58.4
TERM3 (%)	25	32.0	80	61.3	149	49.0	254	51.2	89	37.1
				Enrollment						
ROLEO (%)	25	4.00	80	2.50	149	2.01	254	2.36	89	3.37
BLINFUNF	12	2.67	36	2.58	48	2.19	96	2.40	43	2.70
		(1.07)		(1.38)		(0.53)				
BIN3OTMD (%)	2	0	11	18.2	19	21.1	32	18.8	12	16.7
BINSTAT (%)	13	23.1	38	44.7	60	25.0	111	31.5	49	32.7
BINIHEAR (%)	9	0	31	0	38	2.63	78	1.28	34	5.88
HAYCURT (%)	0	—	0	—	0	—	0	—	0	—
SQRGHIO	23	6.07	77	5.99	142	6.00	242	6.00	84	5.98
		(0.96)		(0.93)		(0.95)		(0.94)		(1.04)
SQRMHIO	11	6.08	55	6.10	95	6.14	161	6.13	54	6.11
		(0.43)		(0.44)		(0.43)		(0.43)		(0.44)
				Exit						
ROLEX (%)	25	4.00	80	2.50	149	3.36	254	3.15	89	3.37
WLNFUNFX	24	2.58	74	2.82	128	2.91	226	2.85	82	2.82
		(0.88)		(1.47)		(1.39)		(1.38)		(1.54)
BLNFUNFX	24	2.46	74	2.55	127	2.67	222	2.61	82	2.68
		(0.72)		(1.06)		(1.20)		(1.11)		(1.45)
BIN3OTMX (%)	13	53.8	44	27.3	79	22.8	136	27.2	49	30.6
BINSTATX (%)	22	4.55	68	0	119	2.52	209	1.91	80	1.25
BINIHERX (%)	20	5.00	63	9.52	109	3.67	192	5.73	78	15.4
HAYCURTX (%)	15	6.67	59	16.95	109	23.9	183	20.2	59	35.6
SQRGHIX	24	5.50	75	5.46	131	5.76	230	5.63	88	5.31
		(1.57)		(1.98)		(2.10)		(2.01)		(1.55)
SQRMHIX	20	5.47	72	5.78	123	5.96	215	5.85	82	5.75
		(1.35)		(1.48)		(1.31)		(1.37)		(1.43)

NOTE: Standard deviations given in parentheses.

Table E.4

VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES OF SEATTLE CHILDREN AGED 0-13 AT ENROLLMENT, BY INSURANCE PLAN

Variable or Measure	No.	95%/ID Plan	No.	95% Plan	No.	50/25% Plan	No.	Cost-Sharing Plans	No.	Free Plan
				Demographics						
AGE	75	6.33	73	7.96	71	6.40	219	6.89	127	6.75
		(3.70)		(4.13)		(4.07)		(4.02)		(4.13)
MALE (%)	75	48.0	73	53.4	71	57.7	219	53.0	127	49.6
NONWHITE (%)	75	4.00	72	4.17	71	14.1	218	7.34	126	3.96
TINC	74	9.30	69	9.28	68	9.22	211	9.27	120	9.16
		(0.53)		(0.57)		(0.49)		(0.53)		(0.60)
EDUC	75	13.04	72	12.79	71	12.18	218	12.68	127	12.38
		(2.22)		(2.06)		(2.02)		(2.12)		(2.08)
HOSP (%)	72	8.33	72	6.94	67	4.48	211	6.64	119	7.56
MDVIS	71	3.10	72	2.42	66	2.76	209	2.76	119	2.83
		(5.11)		(2.59)		(2.43)		(3.60)		(2.68)
TOOKPHYS (%)	75	68.0	73	68.5	71	53.5	219	63.5	127	51.2
TERM3 (%)	75	81.3	73	65.8	71	76.1	219	74.4	127	81.9
				Enrollment						
ROLEO (%)	75	4.00	73	5.48	71	4.23	219	4.57	127	3.94
BLINFUNF	40	3.15	41	3.46	29	3.17	110	3.27	43	3.30
		(1.92)		(2.26)		(1.71)		(1.99)		(1.60)
BIN3OTMD (%)	37	27.0	38	10.5	27	33.33	102	22.5	37	27.0
BINSTAT (%)	49	10.20	47	0	37	5.41	133	5.26	60	6.66
BINIHEAR (%)	36	2.78	38	10.5	27	7.41	101	6.93	40	5.00
HAYCURT (%)	46	13.0	52	7.69	42	7.14	140	9.3	79	15.2
SQRGHIO	74	6.26	73	5.76	69	6.41	216	6.14	124	5.89
		(2.08)		(2.22)		(2.11)		(2.14)		(2.07)
SQRMHIO	47	5.99	52	5.44	43	6.48	142	5.94	79	5.88
		(1.74)		(1.56)		(1.25)		(1.59)		(1.21)
				Exit						
ROLEX (%)	75	2.67	73	1.37	71	5.63	219	3.20	127	3.15
WLNFUNFX	63	3.00	59	3.17	61	3.18	183	3.11	109	2.54
		(1.37)		(1.60)		(1.25)		(1.40)		(1.06)
BLNFUNFX	63	2.83	59	2.85	61	2.90	183	2.86	106	2.38
		(1.30)		(1.61)		(1.22)		(1.38)		(0.96)
BIN3OTMX (%)	48	45.8	32	37.5	47	25.5	127	36.2	61	41.0
BINSTATX (%)	62	6.45	59	1.69	60	1.67	181	3.31	108	0.93
BINIHERX (%)	54	5.56	54	7.41	58	15.52	166	9.64	91	10.99
HAYCURTX (%)	50	20.00	35	22.86	48	18.75	133	20.3	83	19.28
SQRGHIX	66	5.98	59	5.60	65	6.36	190	5.99	117	5.76
		(2.03)		(1.79)		(2.23)		(2.04)		(1.86)
SQRMHIX	59	5.99	55	5.65	56	6.02	170	5.89	100	5.81
		(1.47)		(1.21)		(1.40)		(1.37)		(1.26)

NOTE: Standard deviations given in parentheses.

Table E.5

VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES OF FITCHBURG CHILDREN AGED 0-13 AT ENROLLMENT, BY INSURANCE PLAN

Variable or Measure	No.	95%/ID Plan	No.	95% Plan	No.	50/25% Plan	No.	Cost-Sharing Plans	No.	Free Plan
				Demographics						
AGE	59	8.49	38	6.91	54	7.49	151	7.73	81	7.52
		(3.89)		(4.04)		(3.98)		(3.99)		(4.04)
MALE (%)	59	54.2	38	55.3	54	38.9	151	49.0	81	59.3
NONWHITE (%)	59	5.1	38	7.89	54	3.7	151	5.30	79	3.80
TINC	58	9.08	38	9.19	54	9.04	150	9.10	78	9.01
		(0.52)		(0.38)		(0.51)		(0.49)		(0.58)
EDUC	54	11.06	38	12.42	51	11.10	143	11.43	81	11.16
		(2.05)		(2.18)		(2.50)		(2.32)		(2.41)
HOSP (%)	57	8.78	35	8.57	53	13.21	145	10.3	80	7.50
MDVIS	56	3.23	35	2.43	51	3.24	142	3.04	76	3.86
		(4.46)		(2.24)		(3.62)				
TOOKPHYS (%)	59	72.9	38	81.6	54	70.4	151	74.2	81	76.5
TERM3 (%)	59	89.8	38	84.2	54	66.7	151	80.1	81	71.6
				Enrollment						
ROLEO (%)	59	5.08	38	0	54	3.7	151	3.31	81	4.94
BLINFUNF	35	3.06	25	2.88	29	2.76	89	2.91	49	2.76
		(1.64)		(1.74)		(1.21)		(1.53)		(1.56)
BIN3OTMD (%)	34	38.2	21	23.8	25	28.0	80	31.3	47	38.3
BINSTAT (%)	41	0	31	0	34	0	106	0	56	1.79
BINIHEAR (%)	33	12.1	22	4.5	26	0	81	6.2	48	6.3
HAYCURT (%)	47	6.38	26	3.8	37	8.1	110	6.4	54	12.96
SQRGHIO	59	6.23	35	6.13	54	6.46	148	6.29	80	5.97
		(2.22)		(1.96)		(2.19)		(2.14)		(2.34)
SQRMHIO	47	5.88	26	6.53	37	6.60	110	6.28	55	6.19
		(1.55)		(1.28)		(1.62)		(1.54)		(1.63)
				Exit						
ROLEX (%)	49	1.69	38	0	54	1.85	151	1.32	81	6.17
WLNFUNFX	48	3.33	32	2.94	52	3.63	132	3.36	67	3.45
		(1.77)		(1.63)		(1.87)		(1.78)		(1.70)
BLNFUNFX	47	3.02	32	2.78	52	3.48	131	3.15	66	3.29
		(1.51)		(1.70)		(1.98)		(1.76)		(1.80)
BIN3OTMX (%)	31	41.9	26	42.3	33	42.4	90	42.2	39	30.8
BINSTATX (%)	51	1.96	31	3.23	43	2.33	125	2.4	58	5.17
BINIHERX (%)	47	8.51	32	15.63	46	15.2	125	12.8	62	6.45
HAYCURTX (%)	34	29.41	25	8.00	33	15.2	98	18.5	46	26.1
SQRGHIX	53	5.53	35	6.25	54	5.88	148	5.84	65	5.26
		(1.95)		(1.47)		(1.74)		(1.77)		(1.81)
SQRMHIX	47	5.61	33	6.61	46	6.03	126	6.03	58	5.61
		(1.69)		(1.47)		(1.26)		(1.53)		(1.36)

NOTE: Standard deviations given in parentheses.

Table E.6

VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES OF FRANKLIN COUNTY CHILDREN AGED 0-13 AT ENROLLMENT, BY INSURANCE PLAN

Variable or Measure	No.	95%/ID Plan	No.	95% Plan	No.	50/25% Plan	No.	Cost-Sharing Plans	No.	Free Plan
				Demographics						
AGE	73	7.03	50	7.50	73	7.49	196	7.32	99	6.78
		(3.75)		(3.71)		(3.81)		(3.75)		(3.55)
MALE (%)	73	49.3	50	52.0	73	53.4	196	51.5	99	55.6
NONWHITE (%)	73	0	50	2.0	71	0	194	0.52	99	1.01
TINC	71	9.25	47	9.23	73	9.22	191	9.23	98	9.02
		(0.48)		(0.48)		(0.41)		(0.45)		(0.63)
EDUC	73	13.01	50	12.32	73	13.15	196	12.89	99	12.97
		(2.02)		(2.08)		(2.59)		(2.28)		(2.25)
HOSP (%)	72	4.17	48	8.33	72	4.17	192	5.21	97	11.3
MDVIS	70	3.63	48	2.77	72	2.56	190	3.01	96	3.56
		(4.33)		(2.19)		(2.40)		(3.23)		(4.03)
TOOKPHYS (%)	73	71.2	50	82.0	73	82.2	196	78.1	99	82.8
TERM3 (%)	73	74.0	50	82.0	73	61.6	196	71.4	99	64.6
				Enrollment						
ROLEO (%)	73	2.74	50	0	73	1.37	196	1.53	99	4.04
BLINFUNF	39	2.28	35	2.83	51	2.43	125	2.50	63	2.49
		(0.92)		(1.81)		(1.22)		(1.34)		(1.22)
BIN3OTMD (%)	36	19.44	32	34.38	48	27.08	116	26.7	60	30.0
BINSTAT (%)	45	2.22	37	2.70	51	3.92	133	3.01	73	0
BINIHEAR (%)	37	10.81	31	9.68	46	6.52	114	8.8	60	13.3
HAYCURT (%)	49	12.24	36	5.56	50	10.0	135	9.6	66	7.58
SQRGHIO	71	6.05	49	5.56	73	6.34	193	6.04	98	6.19
		(2.03)		(1.76)		(2.17)		(2.03)		(1.98)
SQRMHIO	51	6.04	36	6.05	50	6.12	137	6.07	68	6.26
		(1.24)		(1.35)		(1.30)		(1.28)		(1.41)
				Exit						
ROLEX (%)	73	5.48	50	2.0	73	2.74	196	3.6	99	2.02
WLNFUNFX	65	2.77	41	3.00	71	2.70	177	2.80	97	3.07
		(1.52)		(1.45)		(1.32)		(1.42)		(1.31)
BLNFUNFX	64	2.75	40	2.88	71	2.55	175	2.70	95	2.85
		(1.56)		(1.40)		(1.25)		(1.40)		(1.25)
BIN3OTMX (%)	49	26.5	30	36.7	45	26.7	124	29.0	75	33.3
BINSTATX (%)	59	0	37	0	66	0	162	0	91	0
BINIHERX (%)	60	5.0	40	10.0	65	9.2	165	7.9	93	10.8
HAYCURTX (%)	50	16.0	30	6.67	51	17.65	131	14.5	73	15.06
SQRGHIX	66	5.89	43	5.18	71	5.64	180	5.62	96	5.92
		(1.90)		(1.52)		(1.71)		(1.75)		(1.81)
SQRMHIX	60	6.05	39	6.04	67	6.00	166	6.03	85	5.74
		(1.25)		(1.53)		(1.59)		(1.45)		(1.60)

NOTE: Standard deviations given in parentheses.

Table E.7

VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES OF CHARLESTON CHILDREN AGED 0-13 AT ENROLLMENT, BY INSURANCE PLAN

Variable or Measure	No.	95%/ID Plan	No.	95% Plan	No.	50/25% Plan	No.	Cost-Sharing Plans	No.	Free Plan
				Demographics						
AGE	61	7.38	54	7.39	57	8.56	172	7.78	80	6.87
		(4.10)		(4.29)		(3.86)		(4.10)		(3.72)
MALE (%)	61	45.9	54	59.3	57	49.1	172	51.2	80	56.3
NONWHITE (%)	60	60.0	54	75.9	57	47.4	171	60.8	78	50.0
TINC	49	8.81	44	8.67	53	9.13	146	8.88	72	8.95
		(0.81)		(0.80)		(0.47)		(0.73)		(0.78)
EDUC	60	10.78	54	11.30	57	10.68	171	10.91	77	11.53
		(2.29)		(2.17)		(2.82)		(2.44)		(3.20)
HOSP (%)	58	13.79	49	2.04	55	5.45	162	7.41	69	8.70
MDVIS	58	3.60	49	2.31	52	3.75	159	3.25	64	3.59
		(4.75)		(2.55)		(5.25)		(4.41)		(5.81)
TOOKPHYS (%)	61	32.8	54	51.9	57	50.9	172	44.8	80	61.3
TERM3 (%)	61	80.3	54	66.5	57	63.2	172	70.9	80	72.5
				Enrollment						
ROLEO (%)	61	3.28	54	3.70	57	7.02	172	4.65	80	1.25
BLINFUNF	17	3.35	21	2.29	25	2.40	63	2.62	37	3.05
		(2.42)		(0.64)		(0.71)		(1.43)		(1.37)
BIN3OTMD (%)	13	7.69	22	27.3	24	29.2	59	23.7	33	27.3
BINSTAT (%)	19	10.5	26	11.5	27	3.70	72	8.33	45	0
BINIHEAR (%)	14	14.3	22	4.5	22	4.5	58	6.9	28	10.71
HAYCURT (%)	32	6.25	29	10.3	33	0	94	5.3	35	2.86
SQRGHIO	60	5.43	46	6.00	57	5.91	163	5.76	77	5.66
		(1.73)		(2.13)		(1.97)		(1.94)		(1.79)
SQRMHIO	41	6.19	31	6.56	43	6.10	115	6.26	52	6.70
		(1.69)		(1.78)		(1.13)		(1.53)		(1.60)
				Exit						
ROLEX (%)	61	1.64	54	0	57	7.01	172	2.91	80	1.25
WLNFUNFX	41	3.24	45	3.22	52	2.92	138	3.12	73	3.12
		(1.64)		(2.01)		(1.45)		(1.70)		(1.39)
BLNFUNFX	41	2.90	45	2.89	52	2.71	138	2.83	71	3.01
		(1.34)		(1.50)		(1.30)		(1.37)		(1.28)
BIN3OTMX (%)	18	22.2	20	25.0	17	11.76	55	20.0	37	27.03
BINSTATX (%)	42	2.38	46	8.70	47	6.38	135	5.93	67	2.99
BINIHERX (%)	33	15.15	41	14.63	48	8.33	122	12.3	69	11.59
HAYCURTX (%)	29	3.45	29	3.45	31	19.35	89	9.0	55	12.73
SQRGHIX	43	5.64	48	5.80	48	5.14	139	5.52	72	5.65
		(2.17)		(2.09)		(1.91)		(2.06)		(1.82)
SQRMHIX	36	6.28	38	6.96	43	6.07	117	6.42	60	6.65
		(1.59)		(2.04)		(1.44)		(1.73)		(1.55)

NOTE: Standard deviations given in parentheses.

Table E.8

VALUES OF DEMOGRAPHIC, STUDY, AND HEALTH MEASURES OF GEORGETOWN COUNTY CHILDREN AGED 0-13 AT ENROLLMENT, BY INSURANCE PLAN

Variable or Measure	No.	95%/ID Plan	No.	95% Plan	No.	50/25% Plan	No.	Cost-Sharing Plans	No.	Free Plan
				Demographics						
AGE	98	6.44	62	6.17	93	7.73	253	6.85	123	7.28
		(4.21)		(3.90)		(4.27)		(4.20)		(3.93)
MALE (%)	98	50.0	62	56.5	93	50.5	253	51.8	123	48.0
NONWHITE (%)	94	58.5	62	66.1	92	57.6	248	60.1	112	57.1
TINC	83	8.99	55	8.70	73	8.98	211	8.91	99	8.94
		(0.68)		(0.70)		(0.62)		(0.67)		(0.85)
EDUC	98	10.54	62	10.44	91	11.24	251	10.77	122	10.58
		(3.02)		(2.56)		(2.98)		(2.91)		(3.29)
HOSP (%)	86	10.5	60	8.3	84	3.57	230	7.4	106	7.54
MDVIS	84	3.43	57	2.30	82	2.87	223	2.93	98	2.70
		(4.49)		(4.00)		(4.30)		(4.30)		(3.37)
TOOKPHYS (%)	98	56.1	62	43.5	93	62.4	253	55.3	123	60.2
TERM3 (%)	98	79.6	62	80.6	93	67.7	253	75.5	123	76.4
				Enrollment						
ROLEO (%)	98	3.06	62	1.61	93	5.38	253	3.6	123	0.81
BLINFUNF	34	2.47	15	2.60	42	3.31	90	2.88	54	2.81
		(0.90)		(0.91)		(1.99)		(1.54)		(1.64)
BIN30TMD (%)	32	21.87	14	42.9	42	23.8	88	26.1	51	19.6
BINSTAT (%)	48	10.42	26	11.53	54	12.96	128	11.72	67	13.43
BINIHEAR (%)	31	0	14	0	40	5.0	85	2.4	47	8.5
HAYCURT (%)	40	7.50	20	5.0	55	7.3	115	7.0	61	6.6
SQRGHIO	92	5.34	54	5.25	93	5.56	239	5.41	114	5.92
		(1.57)		(1.61)		(1.91)		(1.72)		(2.05)
SQRMHIO	57	6.06	31	5.91	67	6.19	155	6.09	83	6.28
		(1.28)		(1.24)		(1.57)		(1.40)		(1.76)
				Exit						
ROLEX (%)	98	1.02	62	1.61	93	5.38	253	2.77	123	0.81
WLNFUNFX	81	2.23	45	2.78	87	2.70	213	2.54	111	2.37
		(1.00)		(1.82)		(1.77)		(1.55)		(1.39)
BLNFUNFX	81	2.17	44	2.57	84	2.50	209	2.39	110	2.24
		(0.85)		(1.58)		(1.44)		(1.29)		(1.07)
BIN30TMX (%)	55	34.5	26	26.9	41	34.1	122	32.8	72	27.8
BINSTATX (%)	86	6.98	46	0	84	1.19	216	3.2	113	3.54
BINIHERX (%)	80	6.25	44	11.4	79	15.2	203	10.8	104	11.5
HAYCURTX (%)	57	10.53	31	6.45	55	5.45	143	7.69	81	12.3
SQRGHIX	89	5.19	49	5.41	90	5.22	228	5.25	112	5.41
		(1.44)		(1.58)		(1.58)		(1.52)		(1.76)
SQRMHIX	63	5.84	33	5.93	79	5.92	175	5.89	88	5.79
		(1.44)		(2.01)		(1.50)		(1.58)		(1.59)

NOTE: Standard deviations given in parentheses.

Table E.9

PREDICTED VALUES FOR EXIT HEALTH STATUS VARIABLES, BY SITE

	Dayton		Seattle		Massachusetts		South Carolina	
Health Status Measure	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans	Free Plan	Cost-Sharing Plans
Role limitations (%)	1.69	1.79	1.94	2.41	1.73	0.91	1.08	2.84
Mental health rating[a]	5.74	5.90	5.84	5.90	5.67	6.02[b]	6.00	6.00
General health rating[a]	5.41	5.59	5.84	6.01	5.75	5.70	5.50	5.44
Anemia (%)	0.05	1.44	0.87	3.17	1.93	0.82	2.76	2.86
Hearing loss (%)	14.87	5.73[b]	10.28	8.35	6.72	8.69	27.13	28.08
Fluid in middle ear (%)	28.8	27.4	33.6	31.5	24.6	27.0	19.3	18.9
Functional far vision[c]	2.71	2.67	2.37	2.82[b]	2.94	2.85	2.36	2.40
Hay fever (%)	36.15	17.62[b]	15.89	16.73	18.26	14.94	9.39	5.35

[a]0-10 scale; a higher value denotes better health.
[b]Contrast free vs. cost sharing, $p < 0.05$.
[c]In Snellen line values 2 = 20/20, 3 = 20/25, 4 = 20/30.

on the free plan appear to be in poorer health than children on cost-sharing plans. In the other sites, children on the free plan and cost-sharing plans experience similar levels of health status.

Appendix F

RESULTS OF ANALYSES OF EFFECT OF FAMILY INCOME

INTRODUCTION

In the main analyses, we focused on children identified as at risk of illness because of a pre-existing condition. We further examined whether the cost-sharing effect differed for children from families with low incomes compared to those from high-income families. In those analyses we found that poor children on the free plan may have experienced a positive health effect for anemia. These analyses further explore the potential effects of cost sharing on the health of poor and nonpoor children. As in our other analyses, the basic approach was to compute predicted exit values using the same values for the explanatory variables as in the main analyses.

RESULTS

Table F.1 presents enrollment and exit health values for children in families in the bottom 25 percent and the upper 50 percent of the family income distribution. Table F.2 presents predicted exit health status values and contrasts health status of children assigned to the cost-sharing plans. The only significant difference between free plan and cost-sharing plans was observed among the lower-income children. Low-income children with free access to medical care experience less anemia than children in the cost-sharing plans as suggested in our at-risk subgroup analyses. No other differences were observed among the lower- and higher-income children.

Table F.1

HEALTH STATUS VALUES FOR CHILDREN AGED 0-13 AT ENROLLMENT, BY FAMILY INCOME AND INSURANCE PLAN

Variable or Measure	Bottom 25% of Family Income				Upper 50% of Family Income			
	No.	Free Plan	No.	Cost-Sharing Plans	No.	Free Plan	No.	Cost-Sharing Plans
				Enrollment				
SQRGHI0	178	5.22	342	5.44	261	6.40	579	6.22
		(1.90)		(1.87)		(1.85)		(1.81)
SQRMHI0	120	6.16	234	6.14	188	6.25	404	6.09
		(1.53)		(1.59)		(1.32)		(1.21)
ROLE0 (%)	172	5.81	331	3.63	263	1.90	579	3.28
BINSTAT (%)	95	9.47	180	12.22	169	10.06	346	9.54
HAYFCURT (%)	98	7.14	181	4.42	129	10.85	274	11.68
BINIHEAR (%)	70	5.71	134	10.45	129	7.75	267	4.49
BIN30TMD (%)	71	35.21	133	26.32	111	25.23	237	26.16
BLINFUNF	75	2.80	141	2.77	149	2.81	301	2.63
		(1.58)		(1.55)		(1.49)		(1.42)
				Exit				
SQRGHIX	156	5.12	301	5.13	263	5.76	539	5.87
		(1.60)		(1.72)		(1.84)		(1.86)
SQRMHIX	132	5.57	252	5.96	230	5.84	482	5.95
		(1.42)		(1.62)		(1.39)		(1.45)
ROLEX (%)	137	3.65	256	5.86	252	3.17	520	1.92
BINSTATX (%)	142	2.82	287	4.53	244	1.64	503	1.99
HAYCURTX (%)	122	13.11	185	8.11	169	24.26	394	21.57
BINIHERX (%)	146	11.64	269	14.12	225	10.67	476	5.88
BIN3OTMX (%)	102	29.41	162	29.63	138	37.68	318	32.08
BLINFUNFX	148	2.63	287	2.69	250	2.57	525	2.70
		(1.35)		(1.35)		(1.32)		(1.35)

NOTE: Standard deviations given in parentheses.

Table F.2

PREDICTED HEALTH STATUS VALUES, BY FAMILY INCOME AND INSURANCE PLAN

	Bottom 25% of Family Income			Upper 50% of Family Income		
Variable or Measure	Free Plan	Cost-Sharing Plans	Difference Free Minus Cost Sharing	Free Plan	Cost-Sharing Plans	Difference Free Minus Cost Sharing
General health[a]	5.46	5.39	0.07(−0.27,0.41)	5.40	5.49	−0.09(−0.33,0.15)
Mental health[a]	5.57	5.90	−0.33(−0.75,0.09)	5.89	5.88	0.01(−0.34,0.36)
Role	2.45	3.97	−1.52(−4.58,1.54)	2.58	2.25	0.33(−1.61,2.27)
Hay fever	14.94	7.97	6.97(−1.02,14.96)	20.00	15.89	4.11(−2.98,11.20)
Vision[b]	2.64	2.69	−0.05(−0.29,0.19)	2.56	2.64	−0.08(−0.25,0.09)
Hearing	9.04	13.06	−4.02(−9.98,1.94)	10.80	7.09	3.71(−0.43,7.85)
Fluid	24.38	24.54	−0.16(−9.33,9.01)	25.76	25.92	−0.16(−7.80,7.48)
Anemia	1.47	4.59	−3.12(−6.01,−0.23)[c]	2.10	1.37	0.73(−0.99,2.45)

[a]0-10 scale; a higher value denotes better health.
[b]In Snellen line values 2 = 20/20, 3 = 20/25, 4 = 20/30.
[c]$p < 0.05$.

Appendix G

CHILDREN'S HEALTH INSURANCE COVERAGE

Health insurance status has two distinct facets. The first is the percentage of individuals who are insured. The second is the nature of the services covered by the benefit package. Data from the National Health Care Expenditure Survey provides information for assessing the health insurance status of children. This survey provides useful information about the percentage of children insured and more limited data on the benefits private insurance provides children.

PERCENTAGE INSURED

The most recent data on the health insurance status of children were collected in 1977. Present coverage is likely to be similar to that observed in 1977 because the proportion of the under-65 population that holds private insurance has not changed significantly between 1977 and 1983, with three-quarters of the population covered (Gibson, 1984).

The primary source of private health insurance for families derives from employment fringe benefits of the parent (Cafferata, 1984; Monheit et al., 1984). This fact is reflected in the proportion of children and young adults with any form of insurance. Children (0–18 years) are insured by public or private coverage at about the same rate as young working-age adults (Table G.1). Young adults (19–24) just entering the labor force and who have often left their parent's home are the least insured with 69 percent insured for the entire year.

Table G.2 summarizes the health insurance coverage of children in 1977 based on the National Health Care Expenditure survey. A large proportion (69 percent) of children have private insurance coverage for the whole year, whereas 8.0 percent of children were eligible for public insurance for the entire year. About 4.1 percent of children were covered by a combination of private and public insurance during the year.

If we decompose these larger classifications into all possible states of health insurance coverage, then we can better understand the reasons for lapses in insurance coverage for children (Table G.3). Over the course of a year about 17 percent of children experienced periods of no insurance coverage during part or all of the year. About half were not

Table G.1

HEALTH INSURANCE STATUS BY AGE: UNITED STATES, 1977

Age	Population (Thousands)	Health Insurance Status: Always Insured	Sometimes Insured	Always Uninsured
0–18	68,805	82.4	8.7	8.9
19–24	22,307	69.3	14.5	16.2
25–54	78,505	83.6	7.5	8.9

SOURCE: Walden et al. (1985).

Table G.2

HEALTH INSURANCE COVERAGE FOR CHILDREN 0-18: UNITED STATES, 1977

Coverage	Percent
Insured entire year	82.4
Private insurance	70.3
Public insurance	8.0
Private and public insurance	4.1
Uninsured part of year	8.7
Uninsured entire year	8.9

SOURCE: Walden et al. (1985).

protected by either private or public insurance for the entire year, whereas the other half were insured for some portion of the year.

Children's health insurance coverage or lack of coverage results from the insurance status of their family (Monheit et al., 1984). If an adult member of the family is covered, then the children are usually covered. Children with no coverage for the entire year come from families where the parent or parents are working but do not have health insurance as a benefit of employment or have insurance for themselves but not for family members. Some children with no insurance during the year were in families that could not get coverage because of the health status of a parent or could not afford to buy insurance but were ineligible for Medicaid. Some were in families that were able to pay for a

Table G.3

HEALTH INSURANCE STATUS OF CHILDREN
0-18: 1977

Insurance	Percent
Privately insured entire year	70.3
Privately insured part of year and publicly insured remainder of year	4.1
Privately insured part of year and uninsured remainder of year	3.9
Privately insured part of year, publicly insured part of year, and uninsured part of year	0.6
Publicly insured entire year	8.0
Publicly insured part of year and uninsured part of year	4.2
Uninsured entire year	8.9

SOURCE: Walden et al. (1985).

group premium but were not part of a group in which group insurance without a test of insurability was available to them.

Although most children have year-round public or private insurance, a sizable proportion are covered for only part of the year. Children with private insurance for part of the year are likely to be from families in which coverage has lapsed for any of a variety of reasons. The parents may have been unemployed for part of the year or may not have been employed long enough to qualify for insurance benefits. A parent may have become disabled but was not yet eligible for some type of public insurance. A parent may have died or become divorced resulting in a termination or suspension of coverage for a time.

Children with public coverage for part of the year but no other coverage are likely to come from families in which the parent was unemployed long enough and poor enough to become eligible for Medicaid at some time during the year. In other cases, Medicaid eligibility was lost because the parent found a job but is not eligible for health insurance through the employer. Many employees in the lower occupational levels do not receive health insurance as a fringe benefit of employment.

Almost one-third of our children are either uninsured or depend on public health insurance programs. About half (12.8 percent of total) are without any insurance for part or all of the year, whereas the other half (16.9 percent of total) are covered by public insurance programs.

SERVICES COVERED

In assessing the health insurance status of children we must also consider the structure of the benefits that children receive. Much of the medical care for both acute problems and preventive care occurs on an ambulatory basis in physician's offices and clinics. To the extent that health insurance is less likely to cover ambulatory care, children are less well covered by insurance than other age groups. Thus, insured children can be covered for a narrow to a wide range of services.

Because children's private health insurance coverage derives from their parent's insurance, the kinds of coverage held by the working age population is similar to that held by children. Table G.4 indicates the proportion of children and adults with insurance coverage for selected types of services. These proportions have changed very little over time except for dental care benefits, which steadily rose during the 1970s, and coverage of maternity-related services, which under the 1978 Pregnancy Discrimination Act required all employers offering health insurance plans to provide the same benefits as for other medical conditions.

Although the children and working-age adults are insured at about the same rate, clear differences in the benefits covered can be seen. Adults are better covered for services than children. The youngest children (0–6 years) are the least well covered. Seventy-three percent of the young children and 77 percent of school-age children (6–18 years) with private health insurance are covered for inpatient services. Office visits are less well covered for all ages but particularly for the young child. Sixty-two percent of the young children and 66 percent of older children have office visits as a benefit of coverage.

Most insurance policies have limits of various types on how much of a benefit the policy will cover. Deductibles, coinsurance, and other cost-sharing provisions are common features of health insurance plans. These cost-sharing provisions are put together in a wide variety of arrangements among private health insurance plans. Some insurance plans have limits on the amount of a service that is covered and many have total expenditure limits. Many policies do not cover or may exclude preventive services.

Private health insurance has developed as it has, with some services being covered and others excluded from the benefit structure, for complex reasons. Most private health insurance has been developed since

Table G.4

SERVICES COVERED BY PRIVATE HEALTH INSURANCE, BY SELECTED SERVICES AND AGE
(In percent)

Service	Age (years)		
	0–6	6–18	25–54
Any service	74.6	78.2	83.9
Inpatient services	73.0	77.4	83.2
Office visits	61.6	66.1	70.8
Outpatient diagnostic	69.6	73.6	78.4
Prescribed medicines	61.7	64.9	69.5
Maternity care	63.0	67.5	76.4
Mental health	67.4	71.3	75.5
Dental	21.4	21.5	22.2
Out-of-hospital	39.5	43.0	47.9
Vision or hearing	9.8	8.6	9.3

SOURCE: Farley (1985).

the second World War. At that time attention was focused on the health services that were most costly but were incurred by a relatively small proportion of the population at any given time. Health insurance schemes were based on casualty insurance schemes that assumed insurance was appropriate only when three conditions were met:

1. The event or risk insured against is relatively rare for the individual but occurs at known rates for groups.
2. The event is very costly.
3. The event cannot be controlled by the insured individual.

Although many of the services that children use do not have these characteristics, neither do many services health insurance now covers. Since the mid-1960s it has been argued that another reason for insurance is to meet a public policy goal of increasing the use of a desired service. As a result benefit packages were expanded from covering inpatient services to including acute care but generally not preventive services. Because most services provided to children are of a preventive nature, the percentage effectively uninsured is understated by our estimates.

In summary, cost sharing plays a major role in children's medical care. Among the youngest children (0–6 years) three-quarters of services are covered to some extent by health insurance, whereas 84 percent of services are covered for the working-age adult population. Children are less well covered for services they are more likely to use, including office visits and preventive services.

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